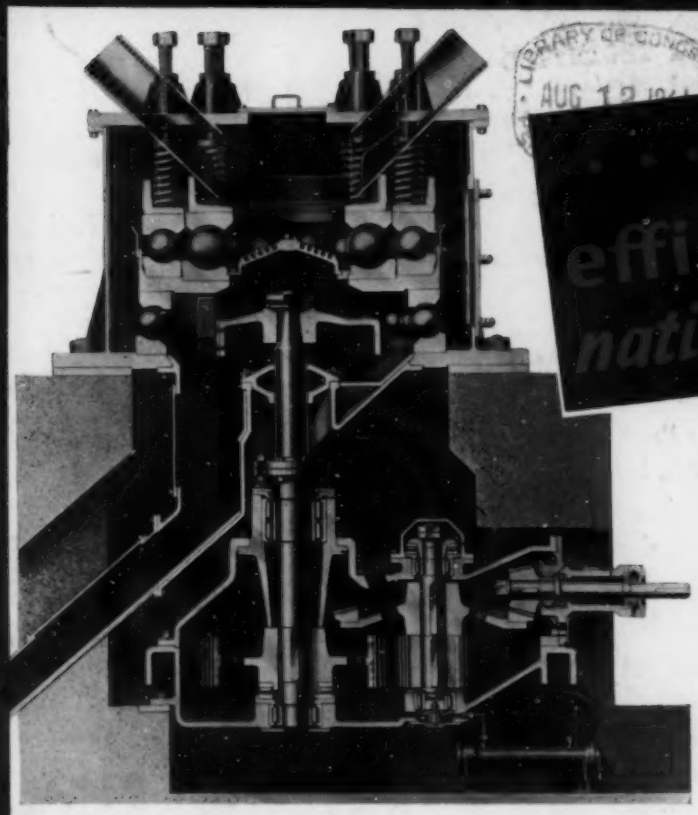
Rock Products

THE INDUSTRY'S RECOGNIZED AUTHORITY



. . . for greater efficiency in this national emergency

To speed up production, and at the same time conserve power and labor, is today's big problem.

The improved B&W Pulverizer, for preliminary or finish grinding, definitely meets these requirements by stepping up output and by reducing power and maintenance costs.

The B&W Closed-Circuit System is adaptable to all capacity requirements. Drying is accomplished within the System — separate drying equipment is eliminated.

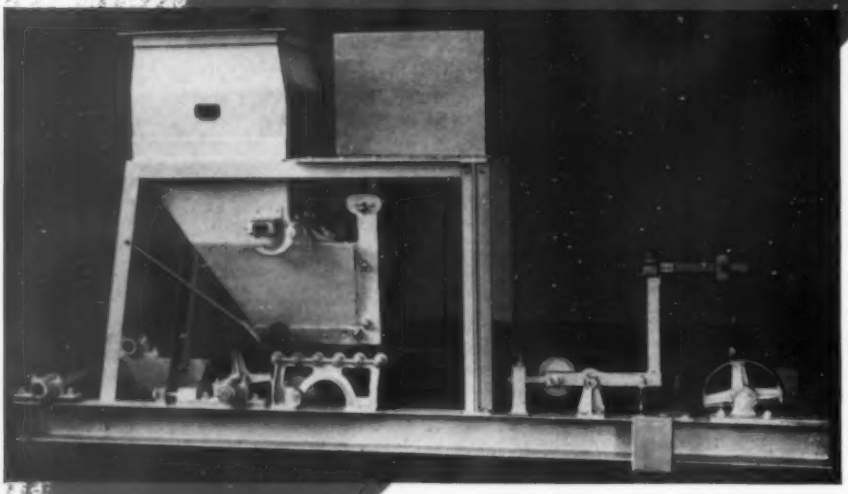
**B&W Closed-Circuit System *for* Raw-Material *and* Clinker Grinding**

C-41

THE BABCOCK & WILCOX COMPANY . . . 85 LIBERTY ST., NEW YORK, N. Y.

BABCOCK & WILCOX

# Another Advance in ACCURATE PROPORTIONING



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*Equipped with motor operated Regulating Gate*

THE electrically controlled Poidometer has shown unusual accuracy in handling stone, clinker, and other material where there is considerable constant variation in size. It is, also, very efficient and self adjusting when the size of the material varies over a period of time. The motor operated regulating gate, controlling the feed of material, responds instantly to a change of weight on the belt scale platform. The Poidometer construction is rigid and durable—the bearings are dust tight, with alemite fittings for proper lubrication — all sensitive operating parts are fully enclosed. The conveying part of the Poidometer may be made any length up to 35 feet.

The amount of material delivered may be varied by applying the desired weight on the scale beam and at the same time adjusting the average height of the regulating gate.

**PROPORTION—ACCURATELY**
**. . . by weight . . .**
**with**
**SCHAFFER POIDOMETERS**

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From here to there . . . that's the object in both material handling and golf. In both fields professional advice can sharpen the accuracy of your timing and direction, give you more 'carry' with less effort, help you select equipment best suited to your needs.

EASTON'S staff of sales engineers are top-flight material handling experts . . . professionals who consistently lick par over the toughest layouts. They are thoroughly familiar with all types of industrial haulage equipment for hand, tractor or locomotive haul or electric self-propelled. They have worked with capacities ranging from 4000 pounds to 250 tons.

Right now, because our plant is working against an abnormal backlog, they have more spare time to give to your problems. Their tips may help you to get better results from equipment which you are now using . . . may show you the way toward instant savings, speed-ups and short-cuts. They can give you new slants on safety, storage and handling methods. They will do their best to fill an urgent order, or to help locate serviceable equipment.

FREE COUNSEL is their contribution to America's Defense Program. You will owe them nothing for it. Write to Engineering Service, Easton Car & Construction Company, Easton, Pa.

**George Fraunfelder**

Easton's Chief Sales Engineer, tees off with a TR-10 Quarry Semi-Trailer . . . cuts more than 25% off the old course record. Details on request.

# EASTON

**EASTON CAR & CONSTRUCTION COMPANY • EASTON, PA.**

AUG 11 1941

# Rock Products

*Recognized the World Over as the Leader in Its Field*

With which has been consolidated the journals *Cement and Engineering News* (founded 1896) and *Concrete Products* (established 1918)

VOL. 44, No. 8, AUGUST, 1941

## *Contents of This Issue*

**The Future of Cement and Concrete**
*Nathan C. Rockwood* 23

**Two Products—One Operation**
Manufacture stone sand and agricultural limestone with four types of pulverizers
*Bror Nordberg* 29

**An "Automat" Storage System**
Radial storage system permits blending to any normal specifications 32

**Flotation Development**
Processing cement raw materials under Breerwood and supplementary patents
*Nathan C. Rockwood* 37

**Making Better Cement at Less Cost**
Union Bridge plant of Lehigh Portland Cement Co. completely rebuilt
*Bror Nordberg* 46

**Ball Coating in Grinding**
Tests show ball coating in grinding is a mechanical process; remedies are suggested
*Fred C. Bond and Fred T. Agthe* 58

**Improve Firing Efficiency**
Volunteer Portland Cement Co. installs unit coal mills and adopts truck haulage 68

**From One to Five Types of Cement**
Improvements at Waco, Texas plant of Universal Atlas Cement Co. include dust collection, clinker cooler and more storage
*C. A. Wallerstedt and H. P. Reid* 75

**Effect of Dispersion on Cement Materials**
*H. L. Kennedy and F. J. Mardulier* 78

**Depreciation in Cement Plants**
Sound depreciation policy will determine justification of new improvements
*W. R. Bendy* 82

**Specification Changes for Rock Products**
A.S.T.M. reports on various tests for non-metallic minerals 84

**Facts About Portland Cement**
Statistics and prices of all varieties, breakdown of production, power consumed 88

**Colored Tiles Sell Joists**
Entire floor construction sold through colored tile and persistent merchandising
*Bror Nordberg* 93

**Continuous Flow Batching**
Simplified system of conveying equipment, and batching plant for 2-cu. yd. mixes 96

**Paint Mixer Trucks Different Colors**
McElwee & Rogy, Inc., ready-mixed concrete plant uses gravity
*Ralph S. Torgerson* 101

**Special Mixes to Order**
Twenty-nine mixer trucks of Maule Industries, Inc., serve Miami area
*Harrie H. Bierman* 103

## Departments

Staff Letter ..... 19
Editorial ..... 23
News and Comment ..... 24
Hints and Helps ..... 26
News About People ..... 28
Cement Section ..... 35
New Machinery ..... 86
Concrete Products ..... 91
Traffic News ..... 126
Index of Advertisers ..... 136

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★

Authentic facts relating to editorial scope and readership analysis.

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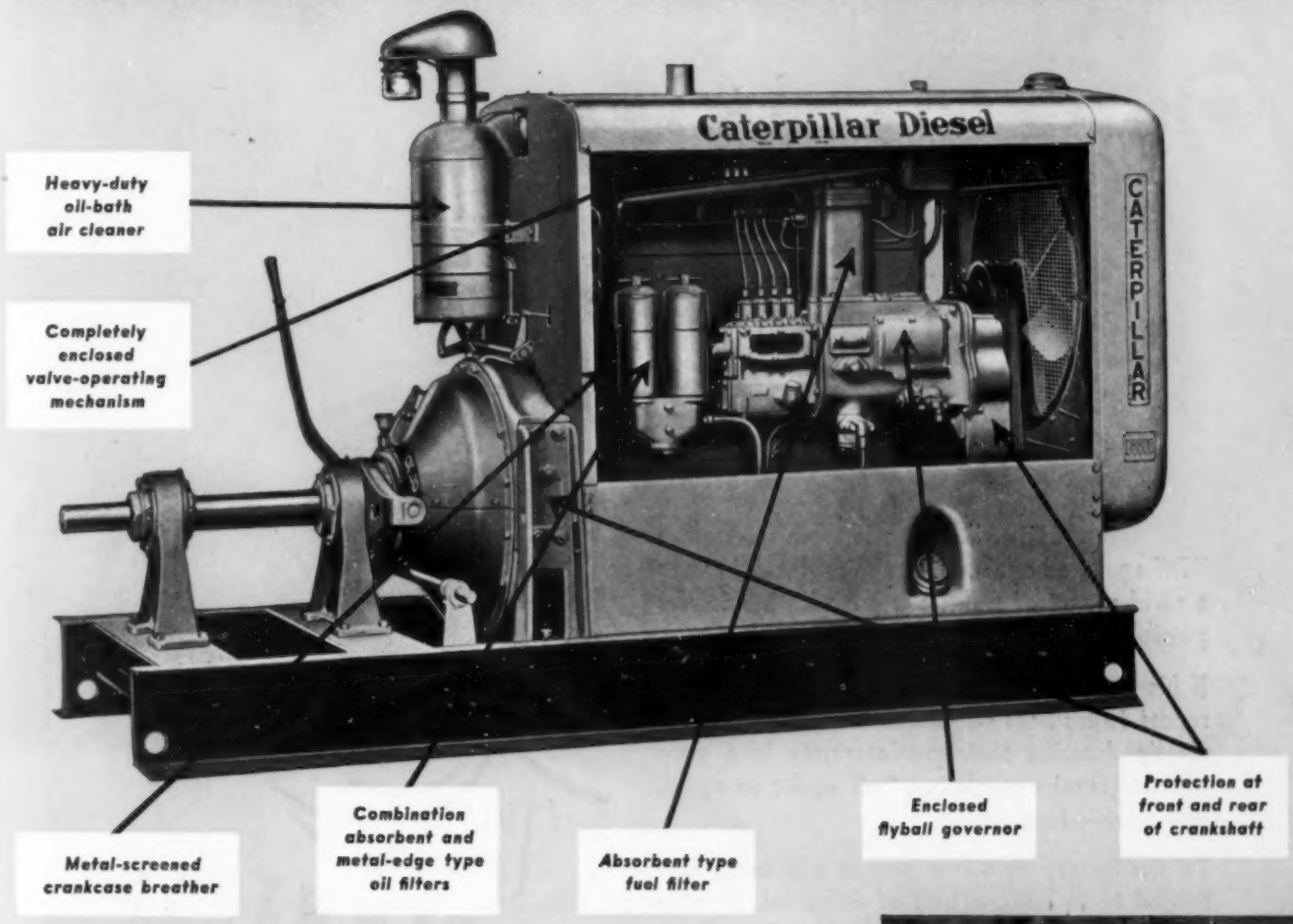
# WELL ARMED FOR DEFENSE

## AGAINST THE DUST AND GRIT OF THE GRAVEL PIT




NOTHING in the operation of a crushing plant is such a constant threat against the life and full-powered performance of its engines as dirt, dust and grit. But in "Caterpillar" Diesels you have the most carefully protected wearing surfaces of any Diesel engines in the world. No possible entry for unwelcome foreign substances via air, oil or fuel is left unguarded. No thought or effort is spared toward enabling "Caterpillar" Diesel Engines to withstand the punishment of day-and-night running under torturing loads, weather or other operating conditions.

Among other recent improvements in "Caterpillar" Diesel Engines are:

**"HI-ELECTRO" HARDENED AND SUPERFINISHED CRANKSHAFT**. . . meaning greatly lengthened bearing life through harder, smoother wearing surfaces than is possible under any other practical method of heat-treatment and finishing.

**"HI-ELECTRO" HARDENED CYLINDER LINERS** . . . direct water cooled for superior cooling and ease of replacement.

**DUAL COOLING** . . . both water and oil cooled—to provide uniform cooling and maximum lubrication efficiency. Air-type oil cooler (exclusive with "Caterpillar") reduces oil deterioration and provides cooler operating temperatures for bearings, pistons, rings and liners.

Let your "Caterpillar" dealer give you other dollars-and-cents figures to show you why "Caterpillar" Diesel Power should be operating your pit or quarry equipment.

CATERPILLAR TRACTOR CO., PEORIA, ILLINOIS

The truck-mounted "Caterpillar" Diesel D13000 Engine driving this Diamond Iron Works portable crushing and screening plant operates 10 hours a day on about 3 gallons of fuel per 50-ton hourly output. ("Caterpillar's" exclusive, highly efficient fuel system requires no operating adjustments and burns a wide range of fuels—including even such extra-cheap lower grade as No. 3 domestic burner oil.)

# CATERPILLAR DIESEL

REG. U.S. PAT. OFF.

ENGINES AND ELECTRIC SETS • TRACK-TYPE TRACTORS • ROAD MACHINERY

# OFF AGAIN, ON AGAIN, DRILL AGAIN,

FINNIGIN

Section Foreman Finnigin's telegram "Off again, on again, gone again—Finnigin" was a vivid report of a difficult job with the fewest possible words.

If his cousin, Finnigin the drill runner, were to report to his boss on Timken Bits he, too, could vividly describe their performance in a very few well-chosen words . . . "off again, on again, drill again—Finnigin."

To the quarry operator who is still using bits forged as an integral part of drill steel, thereby paying unnecessary steel handling costs and yet obtaining less footage per hour, we merely ask him to "think" about the phrase "off again, on again, drill again." It has a lot of ramifications all pointing to faster, cheaper drilling. Just write, we will tell you about them in detail.

**THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO**

OFF AGAIN

ON AGAIN

DRILL AGAIN

**TIMKEN**

TRADE-MARK REG. U. S. PAT. OFF.

*ROCK BITS*

# It's a NATURAL in Rock

or

**SCHOHARIE STONE CO.**
***wouldn't have***
## LORAIN No. 7

## 21 POINTS OF PROFIT
### *IN LORAIN-80 DESIGN AND CONSTRUCTION*

**TURNTABLE**

1. Double Center Drive pinion which —2. Applies power directly—fully concentrated on any one operation— 3. Or spreads power for high-speed simultaneous operations.
4. Two-piece swing drums designed to take the punishment of the hardest worked part of the shovel.
5. Crowd clutch, extra wide to deliver full digging power, mounted on roller bearings; two-piece, easily reversed bands.

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1. Center "Chain" Drive.
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3. Steers either direction.
4. Safety travel and tread lock.
5. Mechanism runs in oil bath.
6. Generous underneath clearances.
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8. Wider treads.

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1. All-welded (strength; all-steel; torsion-resisting).
2. All-steel dipper stick.
3. Door stops to protect stick.
4. Automatic power dipper trip.
5. Automatic crowd brake to hold stick extended.

**CRANES, CLAMS, DRAGS**

1. Simultaneous hoist, swing and travel (or boom derricking).
2. High-speed boom hoist—power and precision control of boom derricking and lowering.
3. "Cable-Miser" fairlead with interlocking, geared sheaves.

THEW CENTER DRIVE

This new 1¾-yd. Lorain-80, which is operated by the Schoharie Stone Co., Schoharie, N. Y., is the seventh Lorain purchased for quarry service by its parent organization, the Cushing Stone Co. That's one successful company's answer to the question, "Are Lorains real rock shovels?" And there are plenty more owners who say "Yes" convincingly, with similar records for repeat orders on Lorains.

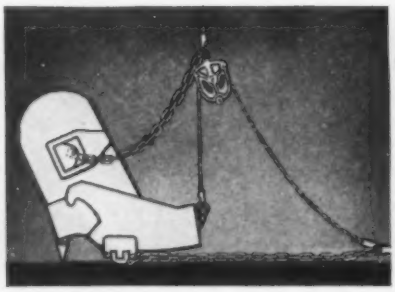
The 1¾-yd. Lorain-80 is but one in the complete line of ⅜ to 2½-yd. Lorains—and you can take your pick knowing that each and every one is a seasoned rock shovel. Write today for complete catalog information.

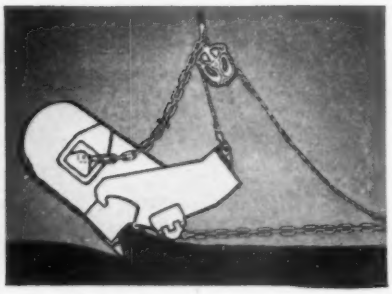
**THE THEW SHOVEL COMPANY**
LORAIN, OHIO

# 1¾ YD. LORAIN-80

## Here's What We Mean by

# AUTOMATIC DIGGING ACTION

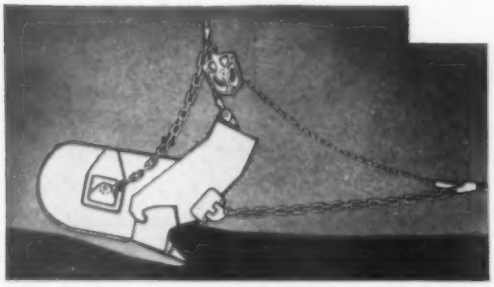




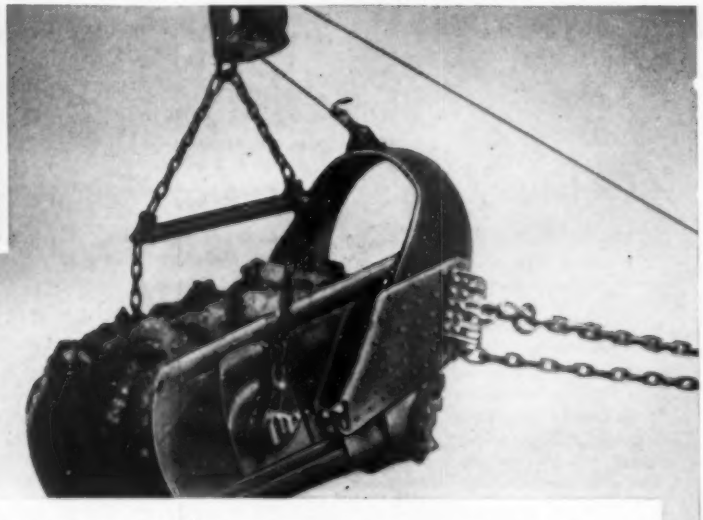
**1.** PAGE *AUTOMATIC* BUCKETS ALWAYS STRIKE FIRST ON THE FORWARD ARCH. The special patented Page construction is the key to AUTOMATIC Digging Action. Because of it.....

**2.** PAGE BUCKETS "AUTOMATICALLY" ROTATE BACK ONTO THE TEETH AND ARCH, holding this position *with all lines slack*, eliminating jockeying and jerking. This means that.....

**3.** PAGE *AUTOMATIC* BUCKETS SOCK RIGHT IN—AT THE FIRST PULL OF THE LOAD LINE. Bearing down with ALL weight on the teeth . . . a Page starts digging NOW! The result is.....



**4.** PAGE *AUTOMATICS* HANDLE EASIER . . . GET THEIR FULL LOADS QUICKER—AT ANY DEPTH! They get a head start of other, slower types. They dig and carry more "pay loads" per shift than any other make of bucket equal in size and weight!



**PAGE** *Automatic* **DRAGLINE BUCKETS**

Address this Coupon to:
Dept. A-27, Page Engineering Company,
c/o Clearing Post Office, Chicago, Ill.

Without obligating me in any way, mail a copy of your new descriptive bulletin entitled "Your Dragline WILL Move Dirt Faster."

*Name*_____

*Street*_____

*City*_____ *State*_____

## HERE'S WHAT IT MEANS TO *YOU!*

A Page AUTOMATIC Bucket on YOUR DRAGLINE means MORE DIRT MOVED PER SHIFT! Operators all over the country—on all kinds of jobs tell us that just by switching to Page Buckets they've increased production 20% to 50%. Get in on this "gravy"—these EXTRA PROFITS. Put a Page AUTOMATIC Bucket on YOUR job and start cashing-in NOW. Let us give you full details. See for yourself what it can do for YOU. Fill out the coupon at the left and MAIL IT TODAY!

**PAGE ENGINEERING CO . CHICAGO, ILLINOIS**

# TRAYLOR

## Cement Equipment

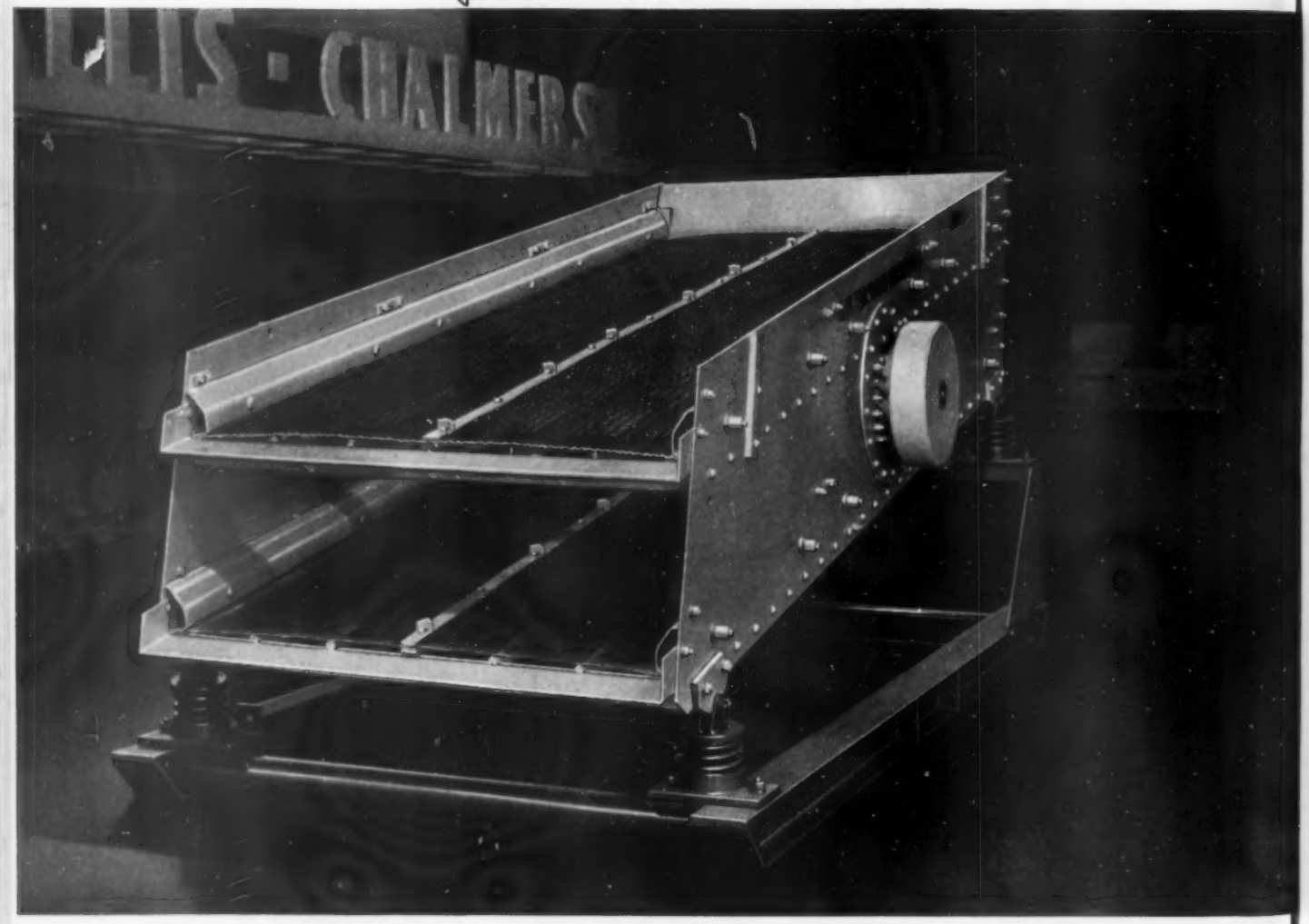
INCREASINGLY, year by year, and particularly in 1941, when plant efficiency is of the greatest importance, the Cement and Process industries, in the United States and many countries abroad, are making certain of maximum production by the use of Traylor Rotary Kilns, Coolers and Dryers, Traylor Grinding Mills and Traylor Jaw, Gyratory and Reduction Crushers. The wide experience of Traylor over many years service to these industries makes every Traylor unit an insurance policy against costly idle periods.

Use our many facilities, created and maintained solely for service to you. Write us whenever you have a problem that is troubling you!

**TRAYLOR ENGINEERING & MANUFACTURING CO.**

**ALLENTOWN, PENNSYLVANIA, U.S.A.**

# NO BUCK... NO JUMP




THE ENTHUSIASTIC RECEPTION GIVEN the Allis-Chalmers Ripl-Flo at the Crushed Stone and Sand and Gravel Shows was characteristic of operators' reaction to this remarkable new screen that costs less than any screen with comparable performance on the market today.

ALLIS-CHALMERS AC MILWAUKEE

## Let ALLIS-CHALMERS COOPERATIVE

# NO GALLOP!

**Uniform Circle Throw of Allis-Chalmers Ripl-Flo Screen Makes Possible Higher Screening Efficiencies. Here Are the Facts on This Remarkable New Screen that Costs You Less than Any Screen with Comparable Performance on the Market Today!**

No buck . . . no jump . . . no gallop! Operators no longer have to put up with "galloping" screens in their plants.

For the new Allis-Chalmers Ripl-Flo Screen is *smooth* starting . . . *smooth* running . . . *smooth* stopping! Dynamic balancing has eliminated rough periods . . . there's no damping of vibration even under the heaviest deck loads.

What's more, Ripl-Flo's uniform circle throw imparts equal vibration to each square inch of the cloth. Material doesn't slow down as it travels over the entire deck. You get exactly the right tonnage for a given angle . . . *with maximum screening efficiency!*

Equally important, there is no severe shaking action . . . material is *rolled* over and over . . . degradation is reduced to a minimum . . . no blinding even on material as fine as reclaimed cement!

Because there are no superfluous parts, the Allis-Chalmers Ripl-Flo Screen *actually costs you less* than any screen with comparable performance on the market today! And the low power consumption of this remarkable new screen (as little as 50% of screens of similar capacity) makes your power dollar go farther.

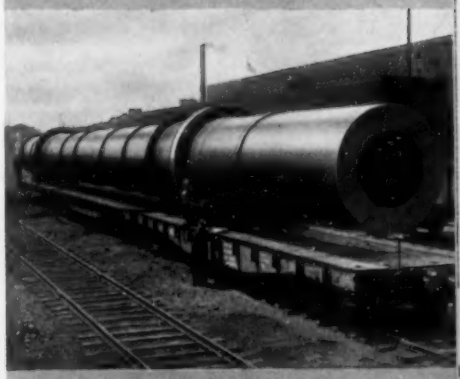
### Cooperative Engineering Cuts Your Costs!

The development of the Ripl-Flo is only one of many contributions Allis-Chalmers Cooperative Engineering has made to the cement industry. Our trained engineers can call on a vast reserve of interrelated experience whenever you bring a problem to Allis-Chalmers. Working with your own engineering staff, they analyze your problem . . . help you get the *right* equipment for the job you want done.

The next time a problem arises in your plant, call in an Allis-Chalmers engineer. Find out how Allis-Chalmers Cooperative Engineering can help you cut your operating costs!

A-1427

## *News of other Allis-Chalmers Products that cut your costs!*



**OVER 55,000 FEET OF ALLIS-CHALMERS kilns are now giving efficient service in plants all over the world. Shown here is an 8'x140' shell of all-welded construction ready for shipment.**

**COMBINATION OF ALLIS-CHALMERS wet process kiln and Air-Quenching Clinker Cooler—like this South African installation—provides uniform, high-capacity production of clinker.**

**PROGRESSIVE STAGE GRINDING, an Allis-Chalmers development, plays a big part in the industry's present excellence of finished product. Illustrated is a 9½', three-compartment Compeb Mill in a Missouri cement plant.**

A-1427

# ENGINEERING *Cut your costs*

THERE is no question about the economy of Bucket Loaders. For twenty years they have loaded material cheaper than any other method or machine.

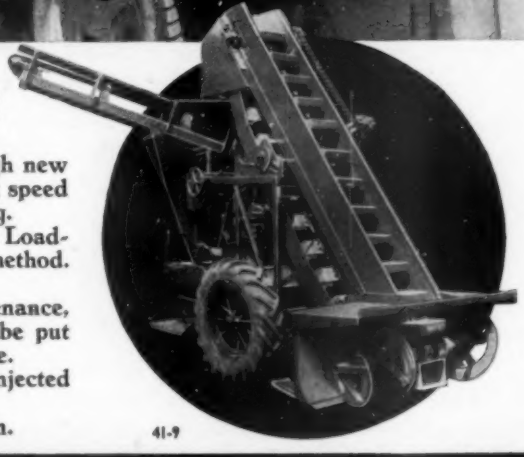
Now the B-G Model 522 offers a new economy through new portability. Not just greater ease in maneuvering—but truck speed towing—with quick and easy hitching—with no dismantling.

This new portability greatly increases the scope that the Loader can cover. It practically obsoletes every other loading method. It makes every other means too expensive.

Simpler systems are now feasible. In highway maintenance, for instance, small roadside stockpiles at the job site can be put down in advance, loaded as needed with the Barber-Greene.

In addition to this new portability, Barber-Greene has injected many other new features into this ingenious design.

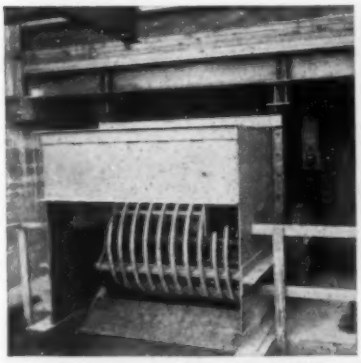
Write for complete information. There is no obligation.



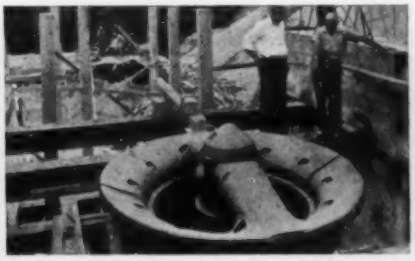
41-9

BARBER GREENE
AURORA ILLINOIS

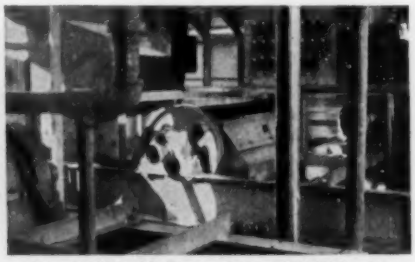
# WATER FOR NEW YORK CITY



*View of one of plant's two 36" x 6' Telsmith Reciprocating Plate Feeders, and No. 540 Telsmith Rotary Grizzly.*



*Plus 4" gravel goes to a No. 16-B Telsmith Gyratory Primary Crusher. Minus 4" gravel and sand is by-passed*



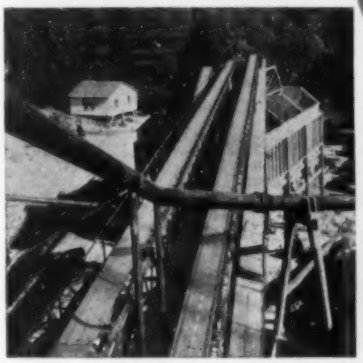
*One 5'x12' Double Deck and two 5'x12' Telsmith Triple Deck Pulsators act as scalping, preliminary sizing and sand separating screens.*

**800,000 yds. of aggregate for Delaware Aqueduct**

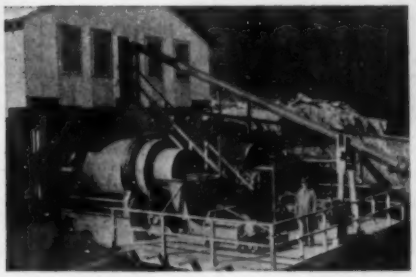
**BEING SUPPLIED BY**

**TELSMITH PLANT**

*One of the two No. 36 Telsmith Gyrasphere Crushers producing minus 1½" or minus ¾" product as required.*



*Telsmith Steel Frame Belt Conveyors take finished sand and gravel to steel bins equipped with Telsmith Bin Gates.*



*Two 72" x 10'6" Telsmith Super-Scrubbers thoroughly clean the gravel, and eliminate any clay or soft stone.*

*Two 3'x 8' Telsmith Double Deck Screens rinse and size the gravel. The lower 1¼" deck dewaters the gravel.*

Processing 800,000 cu. yds. of concrete aggregates for the big Delaware Aqueduct. And meeting the tough specifications of the New York City Board of Water Supply—1½" and ¾" gravel, and minus ¼" sand with no crusher grits. A big job! And it takes a big tonnage plant! The Rossoff Sand & Gravel Corp. has just such a plant near Kerhonkson, N. Y.

In co-operation with Mr. Samuel R. Rossoff and his engineers, this new and completely modern plant was designed by Telsmith. Telsmith built the machinery . . . supervised its installation . . . co-ordinating and balancing every unit. And the plant is turning out its required tonnage every hour. Telsmith sound engineering experience, Telsmith high grade equipment, and Telsmith centralized responsibility, here as in so many other plants, delivered all-around satisfactory results.

Are you about to build a new gravel pit, or quarry plant? Or planning to expand your present plant? Then it most certainly will pay you to find out about Telsmith complete plant service and equipment.

*Get Bulletin G-11.* **Sent free, on request.** G-4

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North Carolina Eqpt. Co. Raleigh and Stateville, N. C.

Wilson-Weesner-Wilkinson Co. Knoxville and Nashville, Tenn.

G. F. Seeley & Co. Toronto, Ont.

# identifies your rope by NAME and COLOR

A colored tape, known as Telfax, is woven throughout the length of all Bethlehem wire ropes. The grade of steel is printed continuously along this tape, and as a double check, each grade has its own special color:

| | |
|---|---|
| Purple | Improved Plow Steel |
| Green | Plow Steel |
| Yellow | Mild Plow Steel |
| Red | Cast Steel |
| Brown | Traction Steel |
| Black | Iron |

These six grades of steel vary greatly in strength. It is important to use the correct grade on any given job. With the Telfax tape you can check grade quickly and easily, even if identifying labels or tags have been lost or the rope respooled.

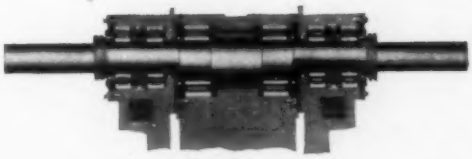
Play-safe. Protect the lives of your workmen and the investment in your equipment by using Bethlehem wire rope, with the Telfax marker.

**BETHLEHEM STEEL COMPANY**

BETHLEHEM STEEL

# HOW SOUNDER ENGINEERING MAKES UNIVERSAL CRUSHERS *a Better Buy!*

Series "SL"—one of 4 types, 26 sizes of Universal Jaw Crushers.



*Dual Bearings Split the Load*

Whether it's a stationary or portable plant Universal Crushers give you maximum performance.

Almost any machine shop could build a crusher that would work. But it takes years of experience, field study and—most important of all—sound engineering to produce a crusher that will not only work, but do the most work with fewer replacements and give the longest possible service life—the Universal Crusher.

For example, take the bearing arrangement on Universal Crushers—two large roller bearings on each side of the frame, instead of the customary single bearing, and two roller bearings on the pitman. Splits the load and shock stress four ways instead of two. That's why they put dual tires on trucks—splits up the load—four tires carry the weight instead of only two; easier on the tires, easier on the roads. Same with Universal's bearing arrangement—easier on the bearings—easier on the crusher.

This bearing detail is typical of the sound engineering throughout every Universal Crusher and Crushing Plant—no excess weight, greater capacity, less power consumed, minimized maintenance. Analyze the engineering design—check their performance and you'll pick Universals every time!

UNIVERSAL CRUSHER COMPANY • 617 C Avenue, West • Cedar Rapids, Iowa

**UNIVERSAL**

CRUSHERS, PULVERIZERS, COMPLETE PLANTS, SPREADEROLLERS, PORTABLE ASPHALT PLANTS

## *WHAT ABOUT–*

# THE LESS COMMON INDUSTRIAL MINERALS?

**Production for 1941 is way up in every one of the less common industrial minerals such as mica, feldspar, silica, phosphate, etc. With many markets needing these non-metallics vitally for national defense manufacture, their importance has grown—and plant operation has been speeded up. Consequently, much interest has been stimulated in what are the latest operating practices of the most progressive manufacturers among the industries. The entire rock products industry as well as those affected want such information.**

## *That is Why*

## ROCK PRODUCTS in September

### *Will Feature . . .*

### Mica, Silica, Feldspar, Phosphate, Rock Wool, Etc.

The feature will be another of ROCK PRODUCTS' series of editorial monograms covering some phase of the rock products industry needing timely, up-to-the-minute operating data. Only because of the broad familiarity our editors have with the industry's technical problems have the editorial monograms been made possible. **In addition** there will be the usual thorough coverage of every major branch of the rock products industry.

**Both readers and advertisers will get lasting value out of the September Issue. Don't Miss it.**

**For Best Position Make Your Reservation Now.**

**Forms Close August 20.**

**ROCK PRODUCTS**

**309 W. Jackson Blvd.**

**Chicago, Illinois**

### Another Big Advertising Opportunity

**The September Issue offers a genuine opportunity for concentrated coverage of the important miscellaneous rock products industries. These industries are big users of machinery and equipment. Their dollar investment in equipment is higher than in plants of the same size in other major branches of the industry because on the whole greater processing is necessary. Here is a double-edged opportunity of immediate and lasting value.**

•

***Advertise in the September Issue***

# It will pay to PLAN AHEAD

GASOLINE • ELECTRIC • DIESEL • OIL

Built in a range of 18 SIZES 3/8 yd. capacity and Larger

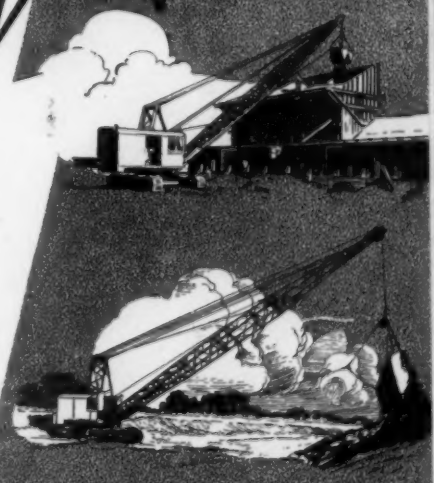
## to have a REAL ROCK SHOVEL

AS the defense ball of orders and construction grows, you need every advantage it is possible to get for speed—for profit!

The Northwest Welded Shovel Boom, the Dual Independent Crowd, the "feather-touch" Clutch Control, the Cushion Clutch, Uniform Pressure Swing Clutches, Differential Steering—Northwest exclusive features combined with other Northwest advantages give you an edge for those fast jobs that every one is shouting for today. *Now* is the time to make your purchases count for the future.

NORTHWEST ENGINEERING COMPANY

1820 Steger Building · 28 E. Jackson Boulevard · Chicago, Illinois

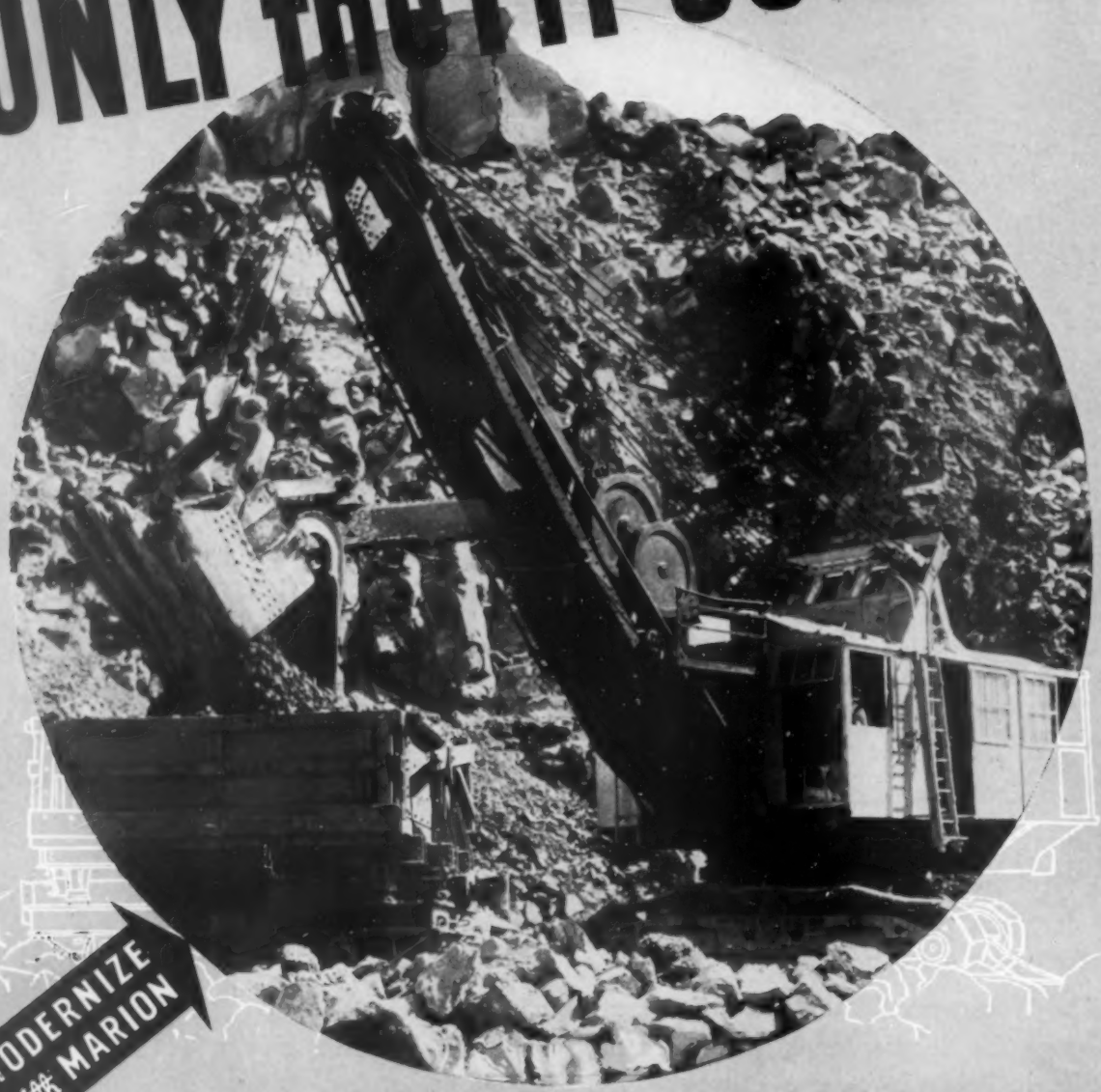


# NORTHWEST

Shovels • Cranes • Draglines • Pullshovels

**REMEMBER!** If you have a Real Rock Shovel you'll never have to worry about output in dirt.

# *Where* ONLY the FIT SURVIVE



MODERNIZE with MARION

It isn't the momentary "spurt" . . . the once-in-a-while digging obstacle . . . that tests a shovel's "metal." It is the constant, the everlasting contact with rock and its reputation for resistance that determines whether you have made a good investment or not. A MARION is built with the survival-of-the-fittest ever before MARION'S engineers. That is why you will invariably find MARIONS on the toughest kind of rock moving projects. » » » » » »

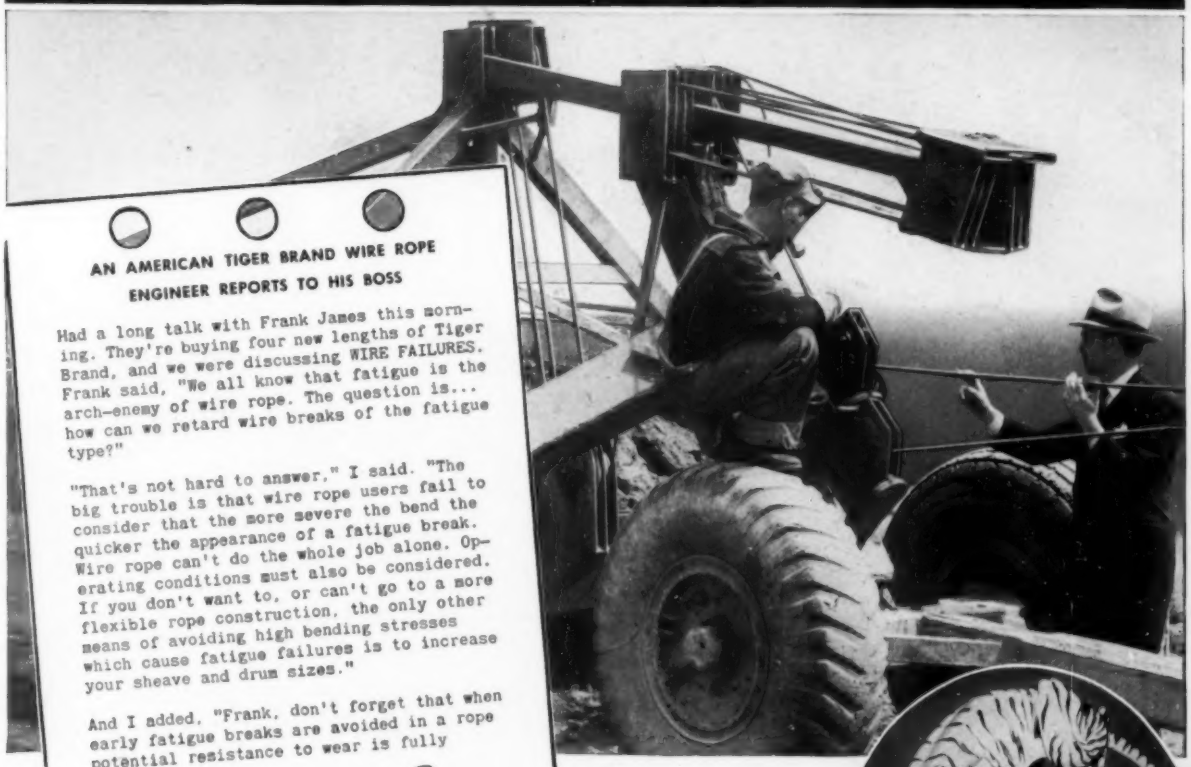
**THE MARION STEAM SHOVEL COMPANY, MARION, OHIO, U. S. A.**

# MARION

SHOVELS • PULL-SHOVELS • CRANES
CLAMSHELLS • DRAGLINES • WALKERS

*From* ¾ cubic yard to 35 cubic yards • Gasoline • Diesel • Electric

# "FATIGUE is the Arch-Enemy of Wire Rope!"



**AN AMERICAN TIGER BRAND WIRE ROPE ENGINEER REPORTS TO HIS BOSS**

Had a long talk with Frank James this morning. They're buying four new lengths of Tiger Brand, and we were discussing WIRE FAILURES. Frank said, "We all know that fatigue is the arch-enemy of wire rope. The question is... how can we retard wire breaks of the fatigue type?"

"That's not hard to answer," I said. "The big trouble is that wire rope users fail to consider that the more severe the bend the quicker the appearance of a fatigue break. Wire rope can't do the whole job alone. Operating conditions must also be considered. If you don't want to, or can't go to a more flexible rope construction, the only other means of avoiding high bending stresses which cause fatigue failures is to increase your sheave and drum sizes."

And I added, "Frank, don't forget that when early fatigue breaks are avoided in a rope potential resistance to wear is fully realized."

George

NUMEROUS conditions affect wire rope life, but none limits normal efficiency more than severe bending. Wire ropes are manufactured in various constructions for the purpose of securing varying degrees of flexibility. However, increased flexibility is secured at the sacrifice of resistance to abrasion, because greater flexibility is produced by increasing the number of wires in a wire rope which means that the size of the individual wires is correspondingly reduced. In order to secure satisfactory rope life it is necessary to specify a rope construction composed of wires of a large enough diameter so that they will not wear through in a comparatively short time. However, if the sheaves over which the rope operates are not of adequate size, bending stresses will be imposed which will cause wire breaks of a fatigue type and consequent removal of the rope at an early stage, even though the wear is slight. The smaller the size of sheave, the earlier these fatigue breaks will occur and the less the potential resistance to failure from abrasion will be realized.

Give these matters the attention they deserve and replacement of wire rope will be much less frequent. You'll get longer cable life.

*Excellay Preformed*

Rely on the advice of the American Tiger Brand Wire Rope Engineer. These men can make recommendations which will correct the difficulties you are encountering. They will work with you, without obligation, to help you secure a full dollar's value out of every dollar you invest in wire rope.

**AMERICAN STEEL & WIRE COMPANY**
*Cleveland, Chicago and New York*
**COLUMBIA STEEL COMPANY**
*San Francisco*
United States Steel Export Company, New York

**UNITED STATES STEEL**

# LUDLOW-SAYLOR

## CONTROLLED-TEMPER SUPER-LOY WOVEN WIRE SCREENS

for super-severe service

●

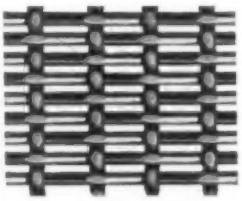
SUPER-HARD, SUPER-TOUGH, SUPER-STRONG

## CONTROLLED-TEMPER SUPER-LOY WOVEN WIRE SCREENS

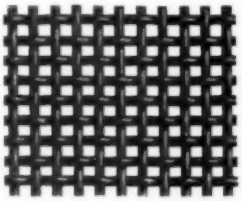
**withstand abrasion** longer —

**endure vibration** better —

**resist fatigue** to the utmost



**REK-TANG** long-slot weave



**DOUBLE-CRIMP** square-mesh weave

The background at top of page shows the "Perfect" Double-Crimp Weave.

The small cuts in the center panel compare REK-TANG Weave and Double-Crimp Weave.

The border at foot of page shows "Perfect" Double-Crimp Steel Wire Cloth which has been hot-dip galvanized after weaving.

Samples on request.

The LUDLOW-SAYLOR WIRE COMPANY SAINT LOUIS

Rock Products

309 WEST JACKSON BOULEVARD
CHICAGO, ILL.

August 1, 1941

Dear Subscriber:

Chicago, Ill.: One of us, Bror Nordberg, associate editor, has returned from an 11,000-mile automobile trip through the Southeast interviewing producers of rock products and photographing all kinds of plants. His travels covered 12 states in 15 weeks and hundreds of calls to see what was going on of real interest to readers of ROCK PRODUCTS. Now, he finds that it's not so much a job to find things worth writing about, as it is to get producers to "ration" him some time at their plants; and to keep from getting run over while there.

Chicago, Ill.: We all want to apologize to our Latin American friends and subscribers for failure to include in this issue reams of interesting and valuable material we have solicited. There is so much of it that we shall probably have to devote most of one issue to Latin America; also much of it has to be translated and digested. We thank you one and all and promise to make good use of this material soon.

Washington, D. C.: Manufacturers' inventories have increased 1.5 billion dollars since the defense program began in May, 1940, and are now the largest on record both in dollar value and physical volume, the Department of Commerce estimated recently in a special survey of inventory accumulation. Analysis of the various types of inventories showed that about 1 billion dollars' worth of the increase was in raw materials, excluding government stock piles. There also was a general increase in "goods in process." Stocks of finished goods have declined, the Department said.

Washington, D. C.: The Puerto Rico Portland Cement Corp., owned and operated by Secretary of the Interior, "Honest Harold" Ickes (through some U. S. Government bureaucracy) sold its cement in 1940 for an average mill price of $1.64 per bbl. The average mill price in the United States (including Puerto Rico) for all portland cement in 1940 was $1.44. And, incidentally, the Puerto Rico plant operated at 100 percent of capacity. Presumably, the Puerto Rico cement is sold at cost to other departments of the U. S. Government, which uses most of the output. This does not rate "Honest Harold" very high as an efficient cement manufacturer. If he is a normal human being he must regret the aspersions he has cast on portland cement manufacturers generally as "robbers."

Chicago, Ill.: Since rubber has been put in the revised priorities critical list by the O.P.M. we have heard that belting manufacturers have been asked to use thinner belt coatings.

Washington, D. C.: Prices of farm products have jumped 26.5 percent in the past year while prices of metals and metal products have risen only 3.7 percent, according to data on wholesale prices published by the U. S. Department of Labor. The gain in farm product prices was the highest of any of the commodity groups covered

by the Department's report, while the advance in the metal series was the lowest. Comparison of prices in other product groups reported by the Department of Labor for the weeks ending June 21, 1941, and June 22, 1940, show the following advances. Foods 19.4 percent; hides and leather 8.6 percent; textile products 17.5 percent; building materials, 9.5 percent, and chemicals and allied products 9.8 percent.

Chicago, Ill.: Our opinion was recently asked about a local concern that is trying to sell a long-range weather-predicting service. We know nothing about it, but the reason for the inquiry is interesting. An agricultural limestone producer would like to know what the weather is going to be a week or two weeks in advance. In this part of the country agricultural limestone is sold by trucking contractors who spread it on the fields for the farmer. The delivered price includes spreading. No truck can navigate our midwest farm lands when they are really wet. So, when a steady rain comes up, the limestone just isn't ordered or delivered. Nevertheless the producer may have ordered a string of cars set on his siding for loading. Without orders, he doesn't load, which is embarrassing under conditions of growing car shortages. Has any reader a solution to suggest?

Birmingham, Ala.: An 8-week's strike of C.I.O. Union employees of the Woodstock Slag Co. ended by an agreement granting wage increases but not closed-shop and check-off demands. The regional director of the Steel Workers' Organizing Committee is quoted as saying: "In view of the national emergency and the fact that the Woodstock company held national defense orders, the men were willing to do their share toward settling the dispute and made concessions that they might not have made in ordinary times."

Chicago, Ill.: Some contractors engaged in national defense construction are taking unfair advantage of the federal government's real and "imaginary" powers in their relations to plant operators. We know of several rock products producers who already have been threatened with drastic action unless they key up their production to almost impossible capacities. These same producers were cooperating 100 percent and had already made all the plant investment they felt they could stand to meet a temporary business condition.

Chicago, Ill.: More and more red, white and blue placards are appearing in the offices of rock products plants in the Southeast, which are engaged in filling large national defense orders. These signs are distributed to plant operators who voluntarily place their productive facilities at the disposal of government for national needs ahead of all other business, when need be. It reminds us of the N.R.A. "Blue Eagle" days.

Washington, D. C.: There are now three separate and distinct bureaus issuing priority orders. Since our July issue (see editorial p. 23) the O.P.A.C.S. (Office of Price Administration and Civilian Supply) has taken over the issuance of priority for a large number of civilian supply industries including mines and quarries. Latest to enter the field is the Department of Agriculture which has appointed L. L. Needler, former secretary of the Indiana Farm Bureau, to be chief of the Farm Equipment and Supplies Division of the Office of Agricultural Defense Relations of the U. S. Department of Agriculture. This division, it is announced, will assist in securing priorities for agriculture. Producers of argicultural limestone take heart!

The Staff

# "With *Gulf* Engineering Service WE GET efficient full-time production,"

*says this superintendent*

## "Yes, we keep our equipment in excellent operating condition in spite of the severe demands we make on it," says this plant engineer.

This superintendent and this plant engineer agree on the benefits they have secured since a Gulf engineer helped them to install proper lubrication in their plant. They find that they get efficient *full-time* performance from their equipment, with no unnecessary delays to interfere with production schedules.

Hundreds of other plant operators who are striving to attain maximum production find that Gulf Engineering recommendations pay dividends. They all report increased output. Some ascribe this to less down-time of equipment. Others, to more efficient operation generally.

Ask the Gulf engineer who calls on you to recommend the proper application of the right lubricants in your plant. You'll get benefits which will show up quickly in your production and maintenance cost records.

The Gulf line of more than 400 quality oils and greases is quickly available to you through 1200 warehouses in 30 states from Maine to New Mexico. Write or phone your nearest Gulf office today.

GULF INDUSTRIAL LUBRICATION

GULF OIL CORPORATION · GULF REFINING COMPANY · PITTSBURGH, PA.

# *Mr. Operator,*

## WHAT WILL BREAK DOWN NEXT?

☆ Now that you have taken on all that extra defense work, Mr. Operator, how about the greatly increased burden on your machinery? Interrupted production—breakdowns—can beat you and your whole defense effort.

Look at that equipment of yours! Last week the plant was down twelve hours for repairs. (Fortunately, the factory was nearby and happened to have the necessary parts!) The other day we pointed out at least a dozen vital points in your plant where badly worn or obsolete machinery was carrying the entire production load. No spares in sight for any of it, either. What'll break down next, Mr. Operator?

Order a thorough check-up today on all possible "trouble points" to get rid of your operating headaches. Then get spare parts or new equipment to bolster the weak spots and step up production.

**HOW ROBINS CAN HELP**

★ Robins offers a complete service in designing, redesigning or enlarging handling facilities for coal, coke, ore, stone, sand and gravel, and other bulk materials. *Conveyors*, *Idlers*, *Pulleys*, *Vibrating Screens* and *Screen Cloth*, *Feeders* and *Gates*, are a few of the many ROBINS products available for reasonably prompt shipment. Address inquiries to Robins Conveying Belt Company, Passaic, N. J.

## ROBINS CONVEYING BELT COMPANY

# THE FUTURE OF CEMENT AND CONCRETE

ONCE UPON A TIME, so an ancient story goes, the owner of a new car wished to test out its reputed speed to his own satisfaction.* Choosing a straight stretch of good road for the trial, he placed his wife in the rear seat with the instruction, "I'm going to let her out a bit, Mamma. Please keep your eye out the back window. If you see a man coming on a motorcycle, be sure and let me know."

"Yes, Papa," she promised, and Papa proceeded to step her up—fifty, fifty-five—"Papa!"—"Yes"—sixty, sixty-five—"Papa!"—"Yes, Mamma, what is it?"—putt-putt—putt-putt—"Papa, the chentleman you vas expecting iss here!"

The "chentleman" we are all expecting is the *Showdown* after war activity is over. It may be a year, or five or ten; but a day of reckoning is coming. The President himself anticipates it; probably if the New Deal lasts that long (and who can tell?) he will be prepared for it, at least as effectively as he prepared for national defense. The principal formula: "The lid is off on public expenditures." The New Dealers contend that the only reason we did not have the present degree of prosperity in the previous eight years of peace was because we did not spend *enough* public money. The theory is that if we can safely increase our national debt from 50 billion dollars to 100 billion dollars to carry on a war, why not increase it to 200 billion for works of peace?

There is some merit in the proposition if we stop to consider that a good part of the 50 billion dollar debt which we have contracted to date represents American resources of materials and man-power actually given away to foreign lands, and most of the new debt now accumulating is for the same purpose. Sure, it keeps many people busy and puts temporary "buying power" in their hands, but the actual, tangible wealth, that is measured only in material things, is gone from us forever. The evidence of debt, which is all our currency amounts to, is merely a reminder of a loss of real wealth. How much better it would be if we could keep our people equally busy and supplied with "buying power," and at the same time retain our actual tangible wealth at home in useful public works and utilities!

Well, anyhow, the President has his National Resources Planning Board at work on a "post-emergency public works program" to absorb the shock when the armament program is over. This time it is to be hoped that we will confine the indebtedness thus to be incurred to American public works and utilities instead for the rehabilitation of Europe. For, while public works construction alone will not take up but a relatively small part of anticipated unemployment, the funds expended, if they are spent effectively, will result in keeping all industry alive.

Undoubtedly, when the war is over we shall have become accustomed to carrying more public debt than ever dreamed of, accustomed to paying higher taxes than ever thought possible. Action and reaction are equal and opposite; and normal reaction would be to cut down all expenditures, public and private. However, we will not live in normal times; we have ceased to evaluate money or debt except in terms of employment. The world over, we have "a new system of economy." Where it will lead to nobody knows, but it is safe to say that hesitation to contract public debt probably never again will prevent employment on public works in times of widespread unemployment, which might on a second occasion be a genuine catastrophe.

Public works, such as are being considered as post-war activities, will involve the use of much cement, aggregates, concrete. These industries, if they are left in private hands, will fare better than many producing consumer goods. That is one reason why rock product producers and manufacturers should not join the chorus now trying to get the Federal Government to be more extravagant at the present time in the matter of public works, housing, etc., for other than defense purposes. Their turn will come; although it may require some present sacrifice. The defense industries, too, are constantly getting a wider base; at present a tremendously large proportion of new plant construction is concentrated in a few localities.

The imposition of priorities on various materials of which rock products machinery is made, car shortages and power shortages, etc., may delay making plant improvements that have been contemplated; but there is no reason to believe that these improvements will not be even more necessary when the defense construction program is over. In short, all plans for meeting post-war conditions, in this country and everywhere else, hinge on large use of cement, aggregates and concrete.

Nathan C. Rockwood

* Credit given to the "Clients' Service Bulletin" of the American Appraisal Co. for this introductory story. However, it was not used as it is used here.—N.C.R.

# NEWS AND COMMENT

## China's New Cement Plants

THE CEMENT PLANT constructed by the North China Cement Co. at Liu Li Ho, south of Peiping, was completed in January 1941. The plant, reportedly now operating, is expected to produce 80,000 tons of cement the first year of its operation.

The output of the Chee Hsin Cement Co. at Tangshan is expected to be increased to 250,000 tons annually, while the Chien Yeh Co. in Taiyuan and Tsinan is expected to produce 60,000 tons and 10,000 tons, respectively, each year.

## Bituminous Coal Prices

A MAXIMUM PRICE for bituminous coal may be proposed soon, Dr. Luther Harr, bituminous coal consumers counsel, indicated recently at a press conference.

Dr. Harr, urging consumers to buy their winter's coal now to avoid overburdening the transportation system in the fall, said he had been consulting with officials of the O.P.A.C.S. on the question of a maximum price for bituminous.

"It is natural to assume that there will be an attempt to boost coal prices and to profiteer," he said, pointing out that already O.P.A.C.S. was receiving complaints on this score. "There is no justification for this, and, if we can help it, we are not going to permit it." Just how far the consumers counsel can help it, however, is a question. This newly established office replaces the consumers division of the Bituminous Coal Commission. It is attached to the commission but independent of it. The commission fixes minimum prices, but has no authority to fix maximum prices.

Dr. Harr said his office would send investigators into the field and then might decide on several fair prices in various areas for different types of coal as maximum prices. "The power of publicity," would be used to keep producers and retailers in line with these, he said. Also, he indicated, O.P.A.C.S. would take action with regard to coal if and when it gets price-fixing authority in law.

While there is no shortage of bituminous coal supply in prospect, Dr. Harr explained, there is a big problem in transportation. Despite the railroads' optimism that they can carry total loads, he said he feared that carload demand in early September will top capacity. He predicted the demand would exceed maximum capacity by 11,035 carloads in the week ending September 13, and that by the week ending October 25 this potential carload shortage might reach 49,978.

## Open-Top Car Shortage

THE ITEM ABOVE is the first estimate of possible open-top car shortage that has come to hand. J. R. Boyd, administrative director, National Crushed Stone Association, and V. P. Ahearn, executive secretary, National Sand and Gravel Association, have been warning their members of a probable car shortage for some time.

## Fifty Billions for Defense

THE NATIONAL ASSOCIATION OF MANUFACTURERS, reporting on the extent of the United States' armaments program, states that $51,575,000,000 is the extent of committments up to July 7 for defense. Of this amount, $40,869,000,000 will come from federal general funds; $7,000,000,000 from the Lease-Lend Act; and $3,706,000,000 is in the form of British orders. Contracts let, as of May 31, were reported as totalling $18,698,000,000.

## Defense Highways

A BILL SUBMITTED by the U. S. House of Representatives Committee on Roads (H.R. 5110) to the House would provide $287,000,000 for the current fiscal year. It provides $100,000,000 for immediate construction or improvement of a network of strategic highways, to be apportioned to the various states; $150,000,000 for access roads to military, naval, defense-industrial sites and to sources of raw materials; $2,000,000 for flight strips along highways for emergency airplane landing; $10,000,000 for planning and surveys, to be apportioned to the various states; $25,000,000 for emergency repairs to highways, made necessary by army maneuvers. The bill was subsequently adopted by the House, and at this writing is before the Senate.

## Priorities and Highways

THE MICHIGAN STATE HIGHWAY DEPARTMENT will help out contractors and material men to this extent, according to official announcement: Where a contractor is unable to complete a project because of shortage of material, the department may delete such portions of the contract as cannot be completed within a reasonable time. However, the state will not adjust any contract prices upward because of delays or expenses in obtaining materials or other emergency conditions beyond the department's control. If it is found necessary to cancel any contract, payment will be made on all completed work and the contractor will be paid cost plus 15 percent for all materials on hand. Because of the threatened shortage of steel the state will not permit a contractor to begin a project until he has all the necessary reinforcing and other steel items on hand. As most steel products are now on priorities, the state will endeavor to get steel priorities on all projects designated as of defense value or part of the strategic military network.

## Accidents Increasing

NATIONAL SAFETY CONGRESS reports that the cement industry accident frequency rate in 1940 was 4.90, an increase of 5 percent over 1939, and the severity rate was 2.46, a gain of 19 percent. For quarries, the accident frequency rate in 1940 was 13.20, a gain of 12 percent over 1939, and the severity rate was 4.08, a decrease of 6 percent.

## Concrete Ships Again?

AN ASSOCIATED PRESS dispatch from Philadelphia late in June makes it appear that the possibilities of using concrete for ship hulls is being agitated again. Shades of 1917! We have seen nothing so far to suggest that the portland cement industry is particularly interested. The news item as published in Chicago reads:

"Concrete tankers and merchant ships as strong and light as steel were envisioned by engineers after a test of a new type vacuum dried concrete containing a new type of steel reënforcement.

"Two 'planks' of the material 12 ft. long and 2½ in. thick were put

through a testing machine at the University of Pennsylvania, a load of 5,890 lb. bending the center of one 5 in. out of line before it began to crack.

"Inventor Karl P. Billner calculated that this imposed a compressive stress within the concrete of 12,500 p.s.i.

"A second plank of slightly different construction withstood a compressive stress of 15,000 lb. and was bent 8 in., springing back to within 1½ in. of its original line as the pressure was released.

"Dr. Theodore Crane, professor of architectural engineering at Yale university and one of those watching the test, said that even allowing a safety factor of 50 percent the new concrete would have a strength 8 to 10 times that of ordinary concrete.

"Mr. Billner has used the vacuum dried material in building floors of a number of government buildings.

"Since the concrete forms can be removed 15 minutes after the material is poured, the inventor said it would be possible to build ship hulls rapidly, a 10,000-ton tanker being constructed of concrete in four weeks."

## Larger Shipments

AN INCREASE of 14.8 percent in freight car loadings in the third quarter of 1941 over those in the corresponding 1940 period was indicated recently in a compilation made by 13 shippers' advisory boards.

The total loadings of the 29 principal commodities were estimated at 7,272,955 cars in the quarter, compared with 6,337,841 a year earlier. All the 13 boards predicted gains for their districts, the Ohio valley region expecting 25.3 percent.

The country-wide figures of interest to rock producfs producers are: Coal and coke, + 17 percent; gravel, sand, stone, + 18.6 percent; cement, + 20.4 percent; lime and plaster, + 12.2 percent, and brick and clay products, + 22.4 percent.

## Strange Armament

WE USUALLY think of army equipment in terms of tanks, guns, search lights, etc. But, we understand that one manufacturer alone is making something like 75 portable crushing plants for the U. S. Army. From which we assume that the modern mechanized army must be prepared to build roads, airports, gun emplacements, bomb shelters, etc. Cement becomes as important as gunpowder!

## Workers Refused Overtime

NASHVILLE BREEKO BLOCK AND TILE Co., Nashville, Tenn., has been upheld by Federal Judge Elmer Davies in a suit for overtime wages filed by employes under the Fair Labor Standards Act. It was held by the court that the instances in which the workers, employed as machine operators and car loaders for the company, dealt in interstate commerce were isolated and not in the normal course of business, and so small as to be not within the purpose of the Labor Standards Act.

## Desist Order Against Lime Producers

THE FEDERAL TRADE COMMISSION ordered 19 Southern producers of lime and Hal S. Covert, of Knoxville, Tenn., their former paid representative, to cease and desist from engaging in a combination or conspiracy to maintain a delivered price system.

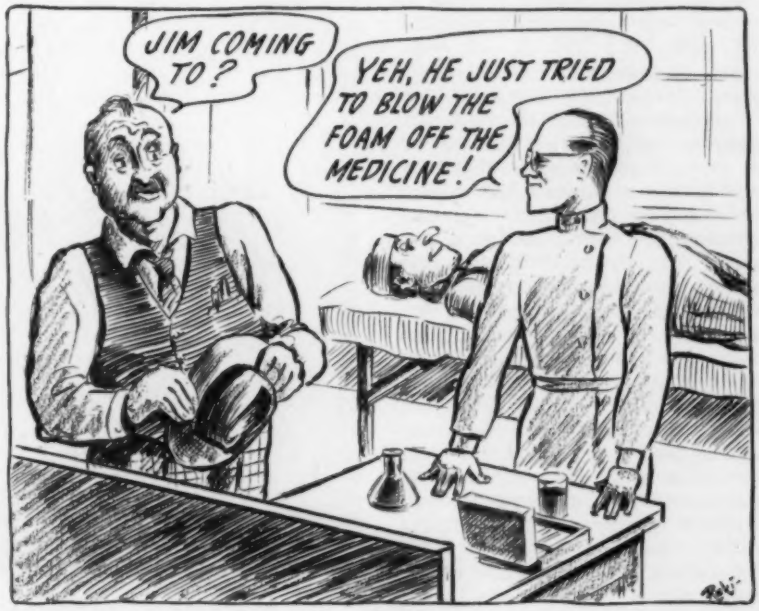
The respondent producers are: Pine Hill Lime & Stone Co., Pine Hill, Ky.; Southern States Lime Corp., Charleston, S. C., and Crab Orchard, Tenn.; Gager Lime Manufacturing Co., Chattanooga and Sherwood, Tenn.; Knoxville Lime Manufacturing Co., Knoxville, Tenn.; Longview-Saginaw Lime Works, Inc., Birmingham, Long View, and Saginaw, Ala.; Cheney Lime & Cement Co., Birmingham, Landmark, and Greystone, Ala.; Ladd Lime & Stone Co., Cartersville, Ga.; Virginia Lime Products Co., Inc., Eagle Rock, Va.; Kimbalton Lime Co., Inc., Shawsville, Va.; Eagle Rock Lime Co., Eagle Rock, Va.; Williams Lime Manufacturing Co., Knoxville, Tenn.; Florida Lime Products Co., Inc., Ocala, Fla.; Dixie Lime Products Co., Ocala, Fla.; Keystone Lime Works, Inc., Keystone, Ala.; M. J. Grove Lime Co., Lime Kiln, Bonsville and Frederick, Md., and Stevensville, Va.; Ripplemead Lime Co., Inc., Ripplemead, Va.; Riverton Lime & Stone Co., Riverton, Va.; Jesse Allen Lime Co., Burns, Tenn., and George L. Scott, Sr., trading as Alabaster Lime Co. Siluria, Ala.

Commission findings are that the respondents produce a majority of the agricultural, structural and chemical lime manufactured in the southeastern States (east of the Mississippi and south of the Ohio and Potomac rivers), but somewhat less than a majority of the lime sold in that region.

Commission findings are that the respondents 'system of identical delivered prices was based on the use of a number of so-called basing points whereby all delivered prices were calculated as though shipments were made by rail from a single basing point or from points having a common or the same freight rate to the respective destination or destinations.

The Commission order directs that the respondent producers, directly or through the respondent Hal S. Covert, cease and desist from continuing or carrying out any agreement, understanding, combination or conspiracy between and among themselves or with others, for the purpose of restraining, monopolizing, or eliminating competition in the purchase or sale of lime.

ADVENTURES OF SUPER DAN, THE SUPERMAN



# Hints and Helps

## ★ FOR SUPERINTENDENTS ★

### Welding Restores Crusher Mantle

SHOWN in the accompanying illustration is a 5-ton gyratory crusher mantle liner which was built up to original dimensions by electric arc welding. The work was done at the Masbate Consolidated Mining Co., Masbate, Philippine Islands.

The liner is 5 ft. in diameter in the base and the weld metal which restored original dimensions is 2 in. thick at the base tapering to nothing 24 in. from the bottom.

Crusher mantle restored to original size by welding on 900 lb. of metal

Approximately 20 days, working 24 hours per day, were taken to complete the work. The 900 lb. of weld metal was deposited by using 3/16-in. Lincoln "Abrasoweld" electrodes.

"Abrasoweld" is a shielded arc type electrode which is used for building up straight carbon steel, low alloy steel or high manganese steel with a self-hardening deposit to resist severe abrasion, pronounced battering and impact. The deposit is said to maintain its toughness and develops its maximum hardness only at the surface where it is cold worked. The cushion of softer metal beneath the surface eliminates checking and flaking. The deposit is claimed to be more resistant to corrosion than high manganese steel. As deposited, the weld metal has a hardness of 20 to 30 Rockwell C. With moderate peening, hardness is increased to 50 Rockwell C.

A. Larsen, welding operator of the mining company who sent in the illustration and information to The Lincoln Electric Co., is shown in the illustration.

### Practical Stabilization of Quarry Topsoil

LIMESTONE is excavated by a combination of open quarrying and drift mining with entrances into the mine driven from the quarry floor level at the Gaffney, S. C., plant of Campbell Limestone Co. The ledge of rock is covered by a 70-ft. thickness of clay overburden on one entire side of the quarry, and directly over some of the mine entrances.

This clay has a tendency to slide and fall into the quarry, particularly when it becomes fluid from heavy rains. Instead of removing large tonnages of the clay, the side of the overburden sloping down to the quarry edge has been trenched in 10 or 15 horizontal rows as seen in the illustration. Soil and fertilizer have been placed in the trenches and the rows have been planted with Kudzu-vine, a plant of the kind used for stabilizing highway cuts and in rolling country to prevent soil movement.

These plants will cover the entire surface in three years, and are of a type used by government agencies to prevent soil movement and erosion. Campbell Limestone Co. has planted it to prevent quarry and mine contamination but, in time, the general appearance will also be improved.

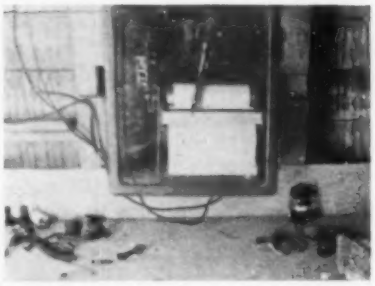
Plant vegetation in trenches to prevent erosion and slides on quarry face

### Automatic Counter for Truck-Loads

SPEED and uninterrupted operation are necessary to meet large volume requirements at the plant of the Becker County Sand and Gravel Co., Cheraw, S. C., where aggregates are produced for the Santee-Cooper Navigation project.

A 2½-cu. yd. Diesel-powered Lima shovel excavates the sand and gravel bank and five Euclid Traktrucks haul material to a hopper feeding the primary belt to the screening plant. These are semi-trailer trucks that haul 10-cu. yd. to a load.

The company uses an "electric eye" at the hopper connected in an electrical circuit to a Westinghouse graphic meter to record when a truck dumps into the feed hopper. The purpose of the arrangement is not to check when each individual truck delivers a load of material to the hopper but to indicate whether or not the stream of trucks is moving without interruptions between the pit and plant.



Graphic recorder which keeps a record of trucks dumping into hopper. "Electric eye" actuates recorder

The beam of the "electric eye" is cast between two uprights at the hopper some 15 ft. over the road-bed level, high enough to prevent cutting the beam unless a truck passes over

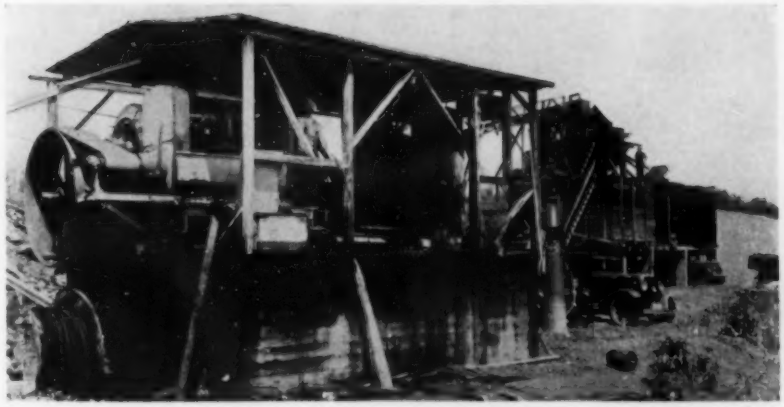
the hopper. A rod fastened to the radiator of each truck extends vertically to the needed height so that a steel plate fastened to the top of it will cut the beam as the truck crosses over the unloading hopper. The grizzley over the hopper is of 9-in. spaced heavy rails that make a stable road base, which will not sink.

The graphic meter records a horizontal line on graphical paper each time a truck passes over the hopper and the paper is calibrated according to the time of the day. Thus, there is made a graphical record of the number of truckloads in a day or in a given hour, but, more important, interruptions are recorded and the chart is the guide to eradicating the causes for delays which recur often and at regular intervals. The chart has space on it to record the tonnage shipped in any day and thus is the means of checking the finished tonnage against production at the pit.

## River Gravel with Diesel Powered Scrapers

THE WORTHINGTON MATERIAL CO., St. Louis, Mo., dredges in the Meramec river in St. Louis county with a very simple plant set-up. At right angles to and about 100 ft. from the river, a concrete foundation and platform was built about 6 ft. above ground, on which two engines were mounted. Each of these engines drives a Sauerman hoist. A cable for each bucket runs from one drum of one of the hoists over an elevated pulley about 50 ft. in front of it, and down to the front end of the bucket. Another cable attached to the back of the bucket extends across the river over a pulley, back across the river again, over another elevated pulley, and then down to the opposite rotating drum of the hoist.

The two scraper buckets are pulled across the river bottom and then dumped over a hopper to a screen. The throughs are carried by a conveyor belt to sizing screens over bins supported on concrete piers which are sufficiently high to permit trucks to load out the excess material from spouts below the bins and transport the aggregates to stockpiles. Twelve dump trucks are used to deliver materials and for stock piling.



Close up of Diesel power plant of Worthington Material Co. on Meramec river, with screening plant to the right

This plant has used all types of power; steam engines, gasoline engines and Diesel engines. A Model HP-600 Cummins Diesel was installed to operate one of the hoists. It was found that the Diesel would pull a loaded 2½-cu. yd. scraper bucket across the river faster than a gasoline engine of the same rated horse-power could pull its 1½-cu. yd. bucket, indicating a 60 percent greater productive capacity than the gasoline engine. Fuel consumption of the Diesel averages from 15 to 18 gal. for a 9-hr. day as compared with the gasoline engine's consumption of about 30 gal.

In the accompanying illustrations are shown the method of excavating material from the river by scraper-bucket. The Diesel engines are mounted on a concrete floor well above ground level for stability and as a precaution against floods.

Showing method of reclaiming material from river by scraper bucket and hoist

## Handling Cement in Batching Plant

CEMENT HANDLING FACILITIES were provided for in the new ready-mixed concrete plant of New Albany Ready Mix Concrete, Inc., at Jeffersonville, Ind., to handle bulk cement in gondola cars, box cars, or in sacks. The purpose of this flexibility is in the event of a possible shortage of hopper-bottom type bulk cement cars.

Bulk cement cars discharge into a cross-screw conveyor which feeds a bucket elevator filling a bulk cement bin of 600 bbl. capacity. The screw conveyor has sufficient length and its housing is provided with a fitting to which a hopper spout may be quickly fastened, for unloading bulk cement from box cars or into which cement in sacks can be emptied.

Cement handling equipment to receive cement in gondola cars or box cars

As a regular practice, cement as withdrawn from bulk cement cars is used in batching out concrete. When operating at capacity, or near capacity, this plant utilizes cement in batches about as fast as fresh cement can be drawn from cars and placed in the bin. Ordinarily the bin is not permitted to fill up, when cars are known to be available, to prevent packing inside the bin and arching which is so troublesome in withdrawing finely ground materials. Cement, so handled, is in a fluffy, fluid condition which is easy to handle.

# NEWS ABOUT PEOPLE

W. B. ELCOCK has been elected president of the Southern States Portland Cement Co., Rockmart, Ga., effective July 1. Mr. Elcock has been vice-president and general manager of the company. He started working for the company July 1, 1935. Other officers recently elected are: James Van Deventer, chairman of the board; Ben T. White, first vice-president, and Hugh F. Van Deventer, Jr., vice-president and assistant secretary.

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STIRLING TOMKINS, president, New York Trap Rock Corp., New York, N. Y., missed the summer meeting of the board of directors of the National Crushed Stone Association because he is on a vacation cruise to South America.

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ANTHONY ANABLE, Dorr Co., New York, N. Y., and frequent contributor of articles in ROCK PRODUCTS, has become engaged to Miss Gloria Hollister, research associate to the director of the Department of Tropical Research, New York Zoological Society. He will enter the ranks of the benedicts in September.

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W. LEE HEIDENREICH, a mining engineer (and brother of E. Lee Heidenreich, Jr., former general superintendent of the New York Trap Rock Co.), has returned from Bolivia. The personal item about the Bolivian trip of W. Lee Heidenreich, in the April issue of ROCK PRODUCTS, unfortunately confused him with his brother. E. LEE HEIDENREICH, JR., who is now a consulting engineer in the rock products industry, and since August, 1940, has been consulting, designing and construction engineer for the new plant of the Palmetto Quarries Co., Columbia, S. C.

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J. B. CLEARY, formerly manager of the Haydite Corp., Kansas City, Mo., has become senior inspector for Smith, Hinchman & Grylls, architects for the Remington Arms plant at Lake City, Mo.

R. M. GILLILAND is the newly elected president and general manager of the National Mortar & Supply Co., Pittsburgh, Penn., with lime plants at Cold Springs and Gibsonburg, Ohio. Other officers are W. W. SPRAGUE, vice-president and assistant general manager; W. F. KING, secretary and treasurer; E. J. DIEDERICH, assistant secretary; E. F. KEARINS, sales manager.

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JOHN R. MANTZ has been promoted from night superintendent at Oakmont, Penn., to plant manager of the United States Gypsum Co. plant at Lancaster, Ohio.

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JAMES MCCARTY, purchasing agent and assistant manager, Alexandria, Ind., plant of the General Insulating and Manufacturing Co., recently acquired by National Gypsum Co., has resigned.

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ALBERT Y. GOWEN, internationally known cement manufacturer, financier, and sportsman, has returned to Cleveland, Ohio, where he spent his boyhood, after a long sojourn in England. Mr. Gowen, the son of Caleb Gowen, one-time president of Kelley Island Lime & Transport Co., has been head of powerful Alpha Cement company interests of England which he helped to organize. He was born some 50 years ago in Cleveland, and was graduated from Harvard in 1909. After leaving school, he became well-known as a sportsman. In 1913, his Speejacks was known as the fastest gasoline cruiser in the world and won him a $35,000 wager in a race at Put-in-Bay. He also built a $250,000 ocean-going motor cruiser called the Speejacks to sail around the world.

Mr. Gowen became vice-president of the Lehigh Portland Cement Co. Ten years ago he went to England where he was instrumental in forming the Alpha Portland Cement, Ltd., with plants in Great Britain and South Africa. Mr. Gowen was in Copenhagen, Denmark, at the time of the Nazi invasion and perpetrated a "hoax" at the expense of the German officers which permitted him to reach neutral territory. He weathered some of the worst "blitz" raids on England.

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COL. W. H. MCNAUGHTON, president and RAYMOND HOAGLAND, vice-president and treasurer, Ladd Lime and Stone Co., Cartersville, Ga., the men who are manufacturing "Ladco Bondo," new masonry product and so successfully introducing it, have much in common. They met in France during the World War and both were in business in the East until five years ago, when they took over the reins of the Ladd Lime and Stone Co. The Colonel was in the automobile business and Mr. Hoagland was interested in the real estate business in New York City.

Seeking to get away from the big city life they came south five years ago to Cartersville, to investigate the possibilities of reviving the lime plant, which at one time was controlled by

Col. W. H. McNaughton

the Hoagland family. They liked it so well in the South that they bought the plant and stayed.

They do everything together. Both have been bachelors all their lives and live together in typical southern style on a 300 acre tract of land not far from the plant. The house, in a beautifully landscaped setting, protected by immense shade trees, is outfitted in true colonial style. One of their mutual hobbies is antiques, and everything in the house fits that definition. Other hobbies, mutual to both, are dogs and riding horses.

Overall view of Liberty Limestone Corp. plant. Agricultural limestone unit shown to the left. Note 400-ft. quarry face in background

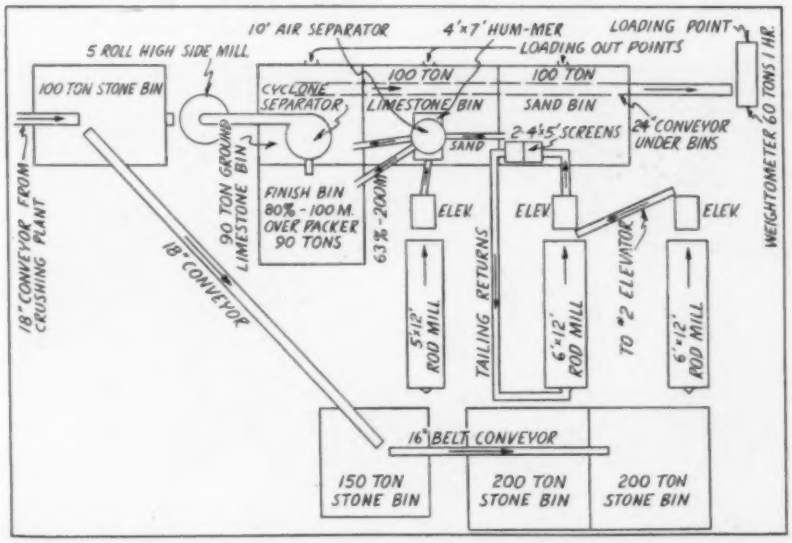
# Two Products—One Operation

**Manufacture stone sand and agricultural limestone. Four types of pulverizing equipment are used**

AGRICULTURAL LIMESTONE and dolomitic limestone sand, for concrete aggregate and masons' purposes, are being produced on a large scale by the Liberty Limestone Corp., Rocky Point, Va., at its Sherwood dolomite quarry near Buchanan, Va. Both sizes are *manufactured* products, and the plant has the flexibility to meet many variations in specifications.

Deliveries of agricultural limestone are being made into West Virginia, North Carolina, South Carolina, and Virginia, while limestone sand is a "cubed" product meeting four or five specifications differing widely in gradation and in their requirements for minus 100-mesh fines.

Four types of pulverizing equipment are used to make agstone simultaneously with limestone sand. Allis-Chalmers rod mills, a Sturtevant ring-roll mill, a Kent mill and a Raymond 5-roll high-side mill, all are used in the manufacture of agstone to easily meet the fineness requirements in the four states. Chemically, the stone is considered ideal for soil application and is guaranteed to contain a minimum of 54 percent $CaCO_3$ and 43 percent $MgCO_3$. It is a hard dolomitic limestone with a Los Angeles rattler loss of only 19 percent in 500 cycles.




Flow sheet of operations, showing flexibility of feeding, screening, and pulverizing equipment in making products meeting different specifications

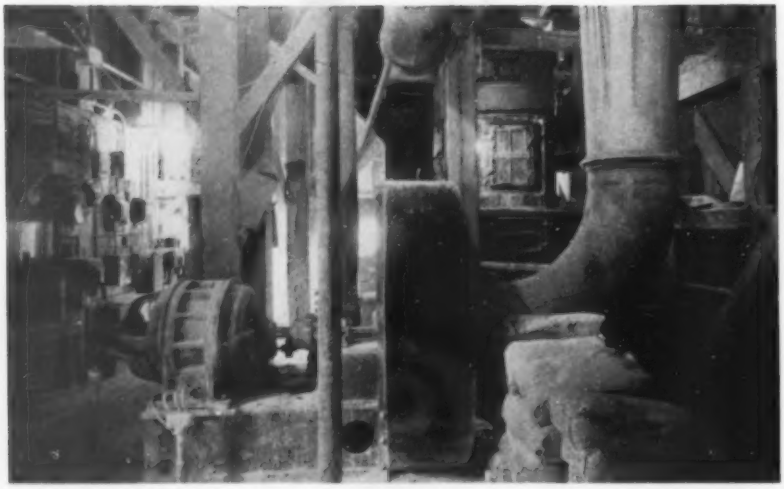
### Agstone as By-Product of Limestone Sand

Dolomitic limestone sand for concrete is produced through the rod mills which operate in closed circuit with a 10 ft. Sturtevant mechanical air separator. Excess fines removed here are recovered as a valuable agricultural limestone by-product. These mills, which have been in operation a comparatively short time, were selected for the two-fold purpose of making both products.

Agricultural limestone is always made incidental to limestone sand manufacture and, at times, becomes the total output of the Allis-Chalmers mills. It is also produced through the other mills.

Until 1940, limestone sand was made by the Kent mill and the ring-roll mill with wet classification to remove excess fines, but this was discarded as a wasteful practice. The Sherwood plant is equipped to utilize all its fines regardless of wet or dry conditions in the quarry. Products range from a 3½ in. top size down to 80 or 90 percent minus 200-mesh fines for mine dust and asphalt filler.

Production of dolomitic limestone sand for concrete is about 14 railroad cars, 55 tons each, in 24-hours (the plant is on a 24-hour schedule) with a simultaneous output of 10 to 14 cars of agricultural limestone. Peak output of agricultural stone is 60 tons per



**High-side mill, which dries as it grinds, in producing fine products, including agricultural limestone**

hour from four sources when the rod mills are operated for that purpose. This is one of the very few crushed-stone plants producing a graded masonry sand which meets with full acceptance.

### Quarry Face 400 ft. High

Liberty Limestone Corp. was organized in 1918 and built the original Sherwood plant in 1934 principally to produce fertilizer filler, ground limestone products, commercial crushed stone, ballast and rip-rap. Its quarry is spectacular, with a working face 400 ft. high within a very short distance of the plant. Twenty foot benches drilled by jack-hammers are the rule in blasting. Large shots would damage the plant.

Steam shovels excavate the limestone and trucks deliver it to the primary crusher. Two years ago, a 24- x 36-in. Type H Traylor Bulldog jaw crusher was installed as the primary breaker. It will handle 130 tons per hour, but the plant rating is about 100 tons of commercial stone per hour. The crusher is fed by a 3- x 10-ft. heavy-duty Traylor apron-type feeder with manganese steel flights which is stopped and started by a push button switch to uniformly load below a 24-in. inclined belt conveyor with stone.

This product is ordinarily put into a 400-ton surge bin, which is a reserve for delays in the quarry and keeps the screening plant uniformly loaded. Reduction crushers are a 36-in. Telsmith gyrasphere which receives its feed from the surge bin, and a No. 25 Kennedy gearless gyratory. Belt conveyors transfer the Telsmith crusher product to an overhead 4- x 12-ft. Tyler-Niagara 3-deck vibrating screen. An alternate flow is in the production of ballast or base stone, when the primary crusher product can be made to by-pass the surge bin on to the belt discharging over the screen.

This screen can produce three products, with the oversize returning into either reduction crusher. Normally the Kennedy crusher is set up closer, but, according to quarry conditions and the product desired, the gyrasphere can be opened up and the other crusher receive all the screen oversize.

Discharge from the second reduction crusher is elevated to a 4- x 10-ft., two-deck Tyler-Niagara vibrating screen. Other products are taken off here into bins.

Fine reduction is done through the Kent mill, including chips, a 10-mesh to ⅜-in. product, and agricultural limestone, from a feed material normally with a top size of ¾-in. In circuit with it is a 3- x 8-ft. single-deck Telsmith vibrating screen.

### Four Sources of Feed

When quarry conditions are wet, the plant operates a 5- x 30-ft. Ruggles-Coles coal-fired, indirect-heat dryer, through which certain stone sizes are put. Thus, the Kent mill can receive feed material from four sources. It may come direct from storage bins, from the screen in circuit with the Kennedy crusher, from the dryer, and also the oversize from the single-deck screen closed-circuited with it. Minus 10-mesh through this screen is agricultural limestone, produced at the rate of five tons per hour. Similarly, the Sturtevant ring-roll crusher, also fed from four sources, is operated in connection with a 4- x 5-ft. Tyler Hum-mer screen with a 10-mesh screen cloth. This mill produces 8 tons of agricultural limestone per hour, running 100 percent through 10-mesh and 56 percent minus 100-mesh.

In earlier attempts, both of these mills produced stone sand and a hydraulic classifier was the means of discarding excess fines. Properties of the sand, as to particle shape and gradation were excellent, but the process was eliminated because too much fines were lost.

### Dry While Grinding

Minus 4-mesh material likely to run high in moisture is pulverized into agricultural limestone by a Raymond 5-roll high-side mill. All the minus 4-mesh from the primary screen, which might carry some fines satisfactory for agricultural purposes but not for stone sand, are pulverized in this mill. This mill is equipped to dry while it grinds, as an air-intake fan pulls heated air from a coal-fired

**Feeding primary jaw crusher. Stone is trucked to the plant**

furnace through the mill. Its separators are disconnected, in producing agricultural limestone at a capacity of 12 tons per hour.

Fineness runs 100 percent minus 20-mesh and 70 percent passing the 100. In producing mine dust, or asphalt filler, to finenesses of 80 or 90 percent minus 200-mesh, capacity drops to 6 or 7 tons per hour, with the separators in operation. While this mill produces an agstone generally finer than is required, the advantage is that the fines are removed by air-flotation without any power consumed in needless grinding, leaving only the coarser particles to be ground.

The three mills discussed have a combined agricultural limestone output of 25 tons per hour, but a bigger output can be produced by the rod mills making limestone sand. These mills were not only selected for both products, but particularly because they grind without excessive fines in making sand.

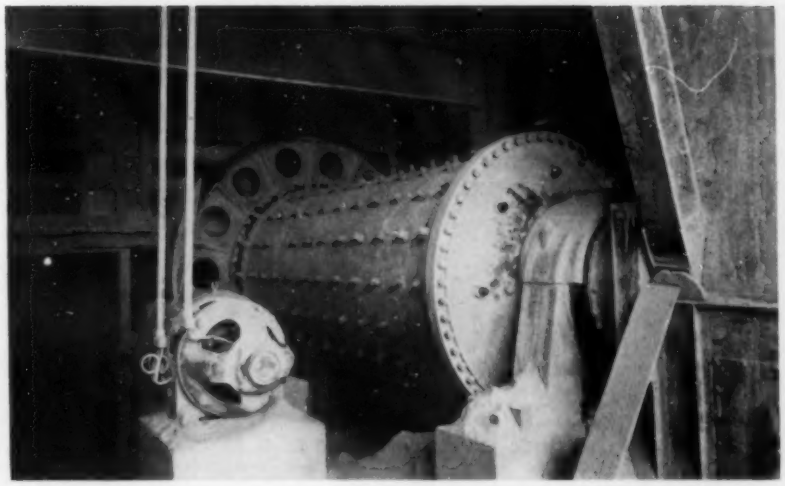
Three of these mills are in operation, including a 5- x 12-ft. Allis-Chalmers mill that has seen more than a year's service and two 6- x 12-ft. mills of the same make that were more recently purchased. The smaller mill, driven through V-belt by a 125-hp. electric motor, turns at 27 r.p.m., and is loaded with 13 tons of rods. The others are driven by 100-hp. motors through Foote gear reducers, to turn at 14 r.p.m.

Each mill can be operated separately from the others, and has a 200-ton overhead surge bin filled by a tunnel belt conveyor running under the commercial plant bins. Feed material is ½- to 1-in. stone, under wet or damp quarry conditions, and 10-mesh to ½-in. when the stone is nearly dry.

Feed into the mills is regulated manually by adjustment of a gate inside an inclined chute from the gravity-type bins, which regulates the depth of bed coming down the chute. Discharge from No. 3 rod mill (see flow sheet) is elevated and transferred into No. 2 enclosed belt bucket elevator which also carries the output of mill No. 2 to two overhead 4- x 5-ft. single-deck Tyler Hum-mer screens in tandem.

**Screening—Air Separation**

In producing agricultural limestone only, 12-mesh screen cloth is used with the fines entering a bin and the rejects returning into the mills. Similarly, No. 1 elevator carries No. 1 mill output to a 4- x 7-ft. Tyler Hum-mer screen set just over a 10-ft. Sturtevant mechanical air separator. In producing agricultural limestone only, 12-mesh cloth is used on this screen and the air separator is by-passed entirely, with oversize returning into the mill.



One of the rod mills used to produce agstone and stone sand. Air separator in circuit on sand to remove fines

This screen has a section of 8-mesh cloth followed by 4-mesh for making sand. Only the minus 8-mesh enters the air separator in producing masons' dolomitic limestone sand, by blanking off the 4-mesh section. Four-mesh becomes the top size of feed into the air separator in making concrete sand. Also, in making sand of either variety, the product of mills 2 and 3 can be put over the screen on top of the air separator, thus blending the product of the three mills to insure a uniform gradation.

All the bucket elevators are enclosed and have automatic overload electric controls. If an elevator stops, all the mills automatically stop, thus avoiding mill overloads.

Tailings from the air separator are the stone sand and the fines are agricultural limestone. In producing both simultaneously, the ratio of production is 70 percent sand and 30 percent agricultural limestone. Agricultural limestone, as a "by-product," tests 80 percent through 100-mesh and 63 percent minus 200-mesh. When made exclusively, it tests 100 percent minus 10-mesh and 56 percent through the 100.

Sand plant operations must be flexible to meet the different specifications. For example, the Virginia State Highway Department asks for a gradation of 100 percent through No. 4 mesh, 50 to 70 percent minus 20-mesh, 5 to 30 percent minus 50-mesh and 0 to 6 percent through 100-mesh. The Bureau of Public Roads asks for 100 percent minus No. 4, 45 to 80 percent minus 16-mesh, 5 to 30 percent minus 50-mesh and 0 to 10 percent through the 100.

One testing engineer requires 100 percent minus No. 4, 90 to 100 percent minus 8-mesh, 45 to 75 percent through 16-mesh, 20 to 35 percent through 30-mesh, 5 to 30 percent minus 50-mesh and 8 to 12 percent finer than 100-mesh. The U. S. Army powder plant under construction at Radford, Va., required 12 to 15 percent minus 100-mesh.

There are several possible ways of adjustment in changing gradation to conform to each specification and in maintaining a uniform grade on any one. Feed rates into the mills may be varied to increase fines, for example; screen openings can be changed and the air separator speed might be slowed down or speeded up. Another way of increasing fines is to blend in bins with the Raymond mill fine product. Masonry sand must meet a requirement of 100 percent minus 8-mesh, 35 to 75 percent minus 50-mesh and 0 to 10 percent minus 100-mesh.

An average of ten cars of concrete sand per day was being shipped for government construction when the plant was visited. Agricultural limestone is also shipped by rail. The latter product is also produced at the company's Rocky Point plant from high calcium limestone, using a 42-in. Fuller mill, a 33-in. Fuller mill and a No. 9 Williams hammer mill and Tyler Hummer vibrating screens.

O. M. Stull is president of the company; J. L. Teaford is vice-president and treasurer; and John R. Rice is sales manager. J. C. Lawrence is general manager in charge of operations; Norman Hotinger is superintendent of the Sherwood plant; and R. C. Smith is superintendent of the Rocky Point plant.

General view of new sand and gravel plant recently placed in operation by Southern Ohio Quarries Co. Gravel storage unit is shown to the left; crushing and sand plant, right foreground; sand storage to extreme right; loading-out bin, center background

# An "Automat" Storage System

**Radial storage system permits blending to any normal specification. Sand dewatering belt is of unusual design**

By BROR NORDBERG

SOME INNOVATIONS in sand and gravel plant design and a high degree of flexibility to meet difficult specifications are to be found in the new plant recently placed into operation by the Southern Ohio Quarries Co. at Chillicothe, Ohio. The design has taken into consideration modern trends in specifications and production as well as providing for future additions.

Production is about 175 tons of washed sand and gravel per hour, and the plant is built around the Kern radial storage system. It's a simple matter to produce 100 percent crushed gravel, or gravels containing the various percentages of crushed particles required in some of the specifications, through blending in loading out from storage.

### Use Sand Dewatering Belt

Production of concrete sand is rather unusual, and consists of blending a mason's sand with certain of the upper fractions produced and stored separately in the aggregates storage system. All oversize gravel is crushed, and some is re-circulated from storage in the production of 100 percent crushed gravel, through an impact crusher, which functions as a plant crusher to "cube" the crushed gravel and to break down some soft particles to improve the final products. Another feature is a new type of dewatering equipment which is a sand dewatering belt conveyor developed by the Fred T. Kern Co. Its purpose is to take masons sand direct from a sand drag and deliver it in a thoroughly dewatered condition to a stockpiling belt conveyor for storage. Nearly all the production is shipped by trucks and the finished sand and gravel are weighed out accurately as the trucks are being loaded.

Excavating sand and gravel with a 2-cu. yd. dragline equipped with a 65-ft. boom. On the left may be seen masons sand storage area

### Sequence of Operations

This plant produces a masons sand, concrete sand, railroad ballast and all grades of commercial gravel from a newly-opened pit deposit. It comprises four main production units with belt conveyors for intraplant transportation.

Incoming unprocessed material is delivered to the first plant division which has a scalping screen to divert oversize gravel into the crusher, to separate fines for the sand equipment below, and to send intermediate sizes of gravel on to the main screening

equipment over the Kern storage system, which is the second principal unit.

Processed sand is moved by an inclined belt conveyor to a second storage area on the side of the scalping-crushing unit directly opposite the gravel storage system. In reclaiming from storage for shipment, either sand or gravel, or both, are brought back to the center for rinsing and delivery by belt conveyor to the loading out equipment.

Production started in June, with the uncovering of 5 ft. of overburden from a deposit which is practically free from clay and other deleterious materials. Sand is 50 to 60 percent of the whole, with very little gravel over 3- or 3½-in. size. A Northwest gasoline-driven dragline with a 2-cu. yd. bucket and a 65-ft. boom does the excavating as well as the stripping, and will eventually dig down 35 ft., of which 15 ft. will be below water.

When first opened, trucks discharged into a hopper to the belt conveyor feeding the plant, but after July 1, when the excavation was fully developed, an 8-ton Plymouth gasoline locomotive was placed in service to haul a train of 5-cu. yd. Western side-dump cars on narrow gauge track to the hopper, which has a 15-cu. yd. capacity.

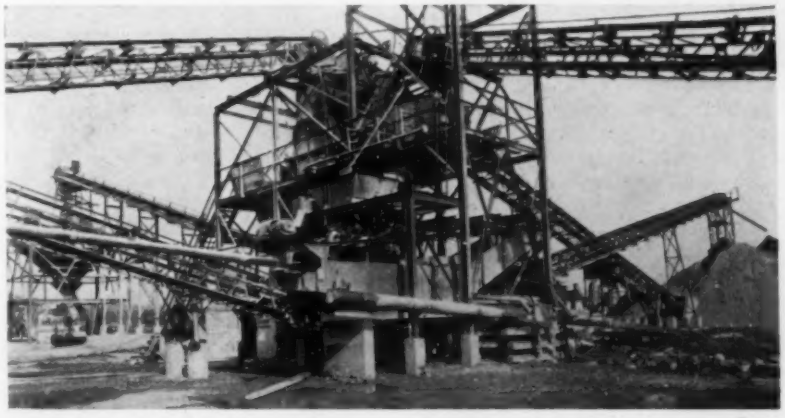
This hopper will be covered with a grizzley to reject plus 6-in. gravel; underneath it is a reciprocating feeder to feed the pit run material on to a 20-in. belt conveyor which discharges, at the head of the scalping-crushing part of the plant, over a 4- x 12-ft. Allis-Chalmers, triple-deck low-head vibrating screen. The feeder is driven off the primary belt conveyor tail pulley. All of the six belt conveyors in the plant are 20-in. width except for a 30-in. belt to load out gravel and sand into cars.

Normally the scalper has 1½-, ⅜- and ⅛-in. square openings on the screen decks consecutively, from top to bottom. Plus 1½-in. gravel drops into a surge box over the crusher, which is a 36-in. Stedman impact-type Disintegrator driven by a 40-hp. motor through V-belt. Other sizes from the screen, of course, also can be put through the crusher.

To the left, truck loading bin; center, crushing and sand equipment; and to the right, radial storage system for gravel

Below the scalping screen is the sand collecting and classification equipment consisting of a No. 7 Telsmith standard sand tank followed by a dewatering drag built by the Fred T. Kern Co. Feed material consists of all minus ⅛-in. material and water passing the lower deck of the scalping screen, the bulk of which enters the tank and then the sand drag. The purpose of the sand tank is to thicken the sand by the removal of some of the excess water and thereby prevent the waste of valuable 50-mesh and 100-mesh fines. Provision is made in the sand drag for side overflow, to retain more fines by keeping them out of the path of the tail-board overflow as much as possible. In other words, the sand equipment produces masons sand and not concrete sand, which is made from stockpiles by a blending process.

Masons sand, as it comes off the drain board of the drag, is made ready for stockpiling by an inclined Dodge belt conveyor after dewatering over a cross belt conveyor. This cross conveyor is the new Kern dewatering belt conveyor, which dewaters as it transfers the sand on to the stockpiling belt. It is inclined at about a 10 percent grade, is 15 ft. in length, with 22-in. belting and travels at about 25 f.p.m. The sand is confined by 12-in. skirtboards to a 12-in. width building up a filtering bed for drainage and the water drops over the sides of the belt on to a pan under the conveyor for its full length. The water drains toward the lower end into the main flume carrying away the overflow water and fines from the sand producing equipment. Water may be introduced through a line near the high end of the trough, if needed, to wash out any sand accumulation in it. Sand is stockpiled in open storage over a reclaiming belt conveyor tunnel. Actually, the sand discharges from the belt about 45 seconds after it falls on to the belt. Different speeds and sometimes adjustable belt elevations would be specified in other plants to remove free water from sands having different characteristics. The drive is a 3-hp. motor with a gear reducer.

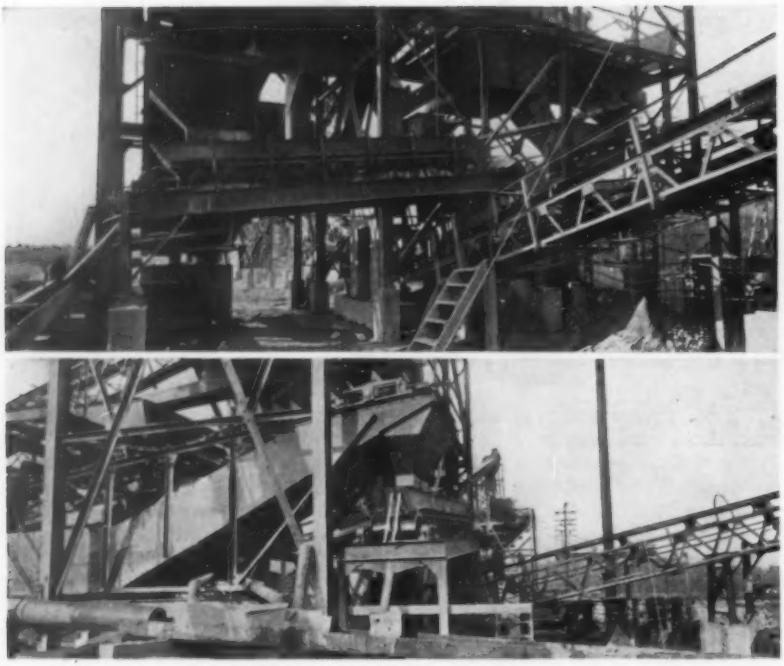


Close-up of crushing and sand plant. In the center, top to bottom, may be seen the scalper, sand tank, and sand drag. Upper right, conveyor carrying raw material, the two below on right handle sand, and those to the left are for gravel

On the far side of the plant from the masons sand storage are the finishing screens superimposed over the Kern radial storage system. These screens are fed by a belt conveyor under the crusher and scalping screen. Ordinarily, when the entire plant is being operated, this feed will comprise the ⅛- to 1½-in. gravel from the scalping screen and the crushed gravel as it comes direct from the crusher.

### Seven-Compartment Storage

This particular Kern storage system is similar to others in that the screens are supported over a central cylindrical tower from which the separating walls radiate out into the storage area. There are compartments



Above: Sand dewatering conveyor with sand drag and overflow pipes on left; conveyor to sand storage on right. Just above right end of cross conveyor is the impact crusher. Below: End view of sand dewatering conveyor showing connection with sand drag, to the left

for seven different sizes of gravel, from which the gravel is withdrawn through gates to the reclaiming tunnel belt conveyor below by means of controls at the top of the tower. A number of adjustments have been calibrated for these controls to accurately control the gate openings in blending gravel from storage for shipment. A 6-ft. square reinforced concrete conveyor tunnel for reclamation, extending under the central tower, has been built as part of the system.

### Screening Equipment

Screening equipment over the central tower consists of a 12-ft. long revolving screen followed by two 3- x 8-ft. double-deck Allis-Chalmers "Aero-vibe" vibrating screens. Three "primary" sizes of gravel are taken off the revolving screens and dropped into storage—a 1½- to 1-in., 1- to ¾-in. and a ¾- to ½-in. gravel usually. Minus ½-in. gravel is then split over one of the vibrating screens having ⅜- and 3/16-in. square openings on top and bottom, respectively. A minus 3/16-in. plus ⅛-in. size is then produced over the other vibrating screen. Crusher dust (minus ⅛-in.) and water are flumed to waste or may be routed into the sand drag to build up the fines in the masons sand if desired.

Live storage capacity is about 75 tons in each of the seven compartments, but there is practically unlimited total storage. A Marion shovel operates in the circle around the storage area, moving the gravel into dead storage or returning it into live storage by means of a cable-pulled ¾-cu. yd. Sauerman open-bottomed bucket.

### Blend Various Sizes from Storage Compartments

Several of the storage compartments are set aside for crushed products, which can then be reclaimed for shipment direct as 100 percent crushed or be blended on the reclaiming belt with uncrushed gravel to produce, say, a 40 percent crushed gravel for Ohio State Highway construction. Thus, a large reserve in storage is available for loading out separate grades, or blended gravels, without operating the pit, crusher or scalping and sand equipment. Also, in one of the bin compartments there is an area set aside for oversize gravel that has passed through the crusher once. Without operating the pit, this material may be reclaimed by the tunnel belt to the crusher to recirculate in producing more crushed faces, or a plus 1-in. uncrushed could be similarly handled to produce, say, a ⅜-in. crushed gravel.

In loading out gravel, or blends of gravels, from stockpiles this tunnel belt returns it to the central crushing plant, where it is routed by appropriate gates and a chute to pass over, or by-pass, a 4- x 10-ft. Allis-Chalmers double-deck, vibrating screen. This screen is purely one for rinsing, with ⅝- and ⅛-in. square openings on its two decks, and a 30-in. belt conveyor carries the gravel into a 4-compartment 150-ton, Heltzel truck loading bin.

Concrete sand is produced by blending while loading. A tunnel belt conveyor under the masons sand stockpile reclaims sand to a chute over the belt filling the truck bins. The head pulley of the masons sand belt and the one from the gravel stockpiles come together at this point—the one carrying masons sand and the other a controlled amount of coarser material from storage. The two blend in discharging on the common belt, to produce concrete sand.

### Truck Facilities

One man operates the loading of trucks from a scale house alongside the Heltzel bin. Each truckload is weighed by a 20-ton Howe scale as the truck stands on a 9- x 34-ft. scale platform under the bin. Each of the four bin compartments has a bin gate operated manually from the scale house by a lever and the gravel, or sand, drops into a collecting box before dumping into a truck. Some blending can be done at this point. Rail deliveries are handled by trucking to a rail siding.

The primary belt is on 114-ft. centers; the one into gravel storage is 132 ft.; to sand storage is 135 ft.; those from both sand and gravel storage are 143 ft.; and the loading out conveyor is on 107-ft. centers. Provision is made in the design for more crushing capacity and for a similar Kern storage system, where the sand is now being stockpiled, to make room for more sizes of material if necessary. Sand is now being stocked over and around a sealed cylindrical tower which can easily be converted into a system like that now in use on gravel. Fred T. Kern Co. designed the entire plant.

Southern Ohio Quarries Co. has offices in Columbus, Ohio, and has been producing aggregates for 15 years. It operates a crushed limestone plant at Peebles, Ohio; a new agricultural limestone plant at Plum Run, Ohio, and has a bituminous road construction plant at Chillicothe.

E. H. Davis is president of the company; H. C. Slater, vice-president and secretary; George Quillen, treasurer; and R. S. Lebold is general manager in charge of production. George F. Driscoll is sales manager and John Wetzel is superintendent of the new plant.

ROCK PRODUCTS, AUGUST SPECIAL

# CEMENT SECTION

Universal Atlas Cement Co. Improvements at Waco, Texas plant.

Development of Flotation.

Improving Kiln Firing at Volunteer Portland Cement Co., plant.

Ball Coating Studies and Suggested Remedies.

Lehigh Portland Cement Co. Modernization at Union Bridge.

Cement Plant Depreciation.

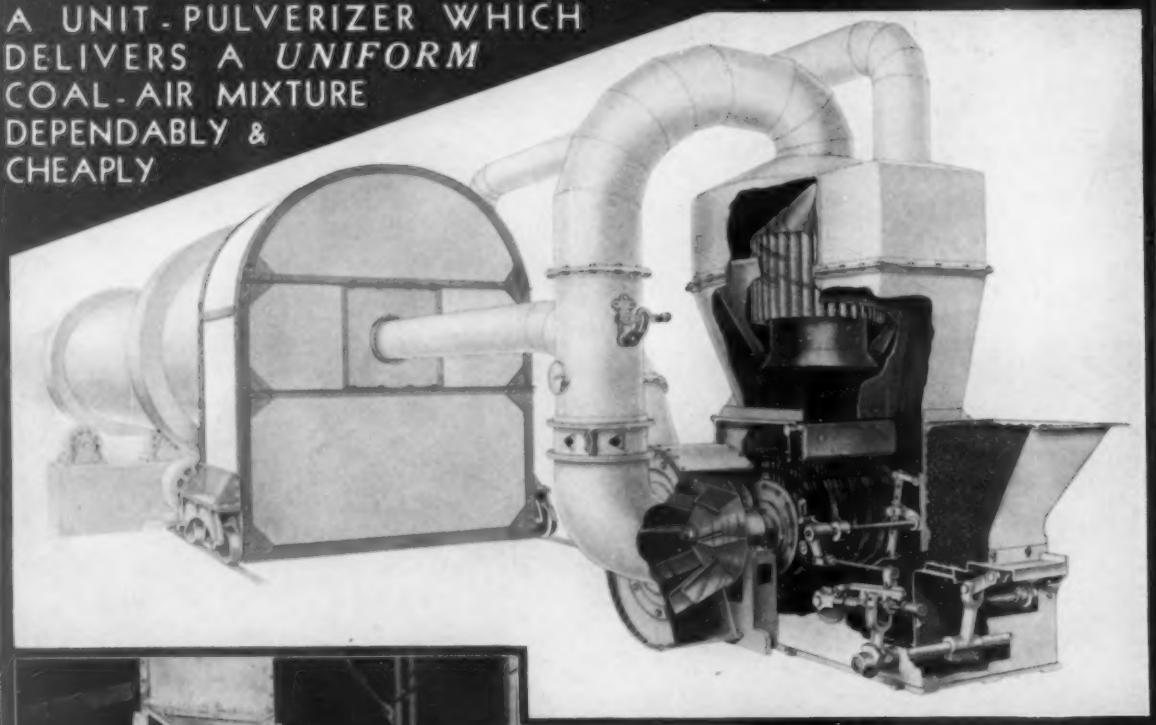
Effect of Dispersion On Cement Raw Materials.

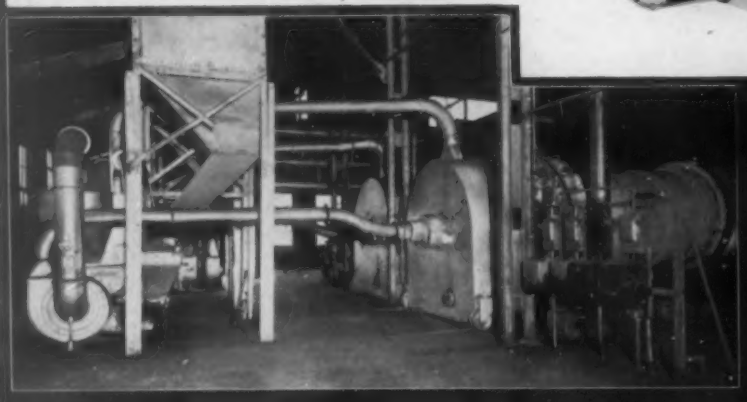
Cement Industry Statistics.

Looking down at Valley Forge Cement Co. plant where flotation system has been installed. Note kiln feed and rejects thickeners, hydro-separator, and centrifuge

# FIRE YOUR KILN WITH A COAL-CARBURETOR

A UNIT-PULVERIZER WHICH DELIVERS A *UNIFORM* COAL-AIR MIXTURE DEPENDABLY & CHEAPLY





A MACHINE THAT USES PRIMARY AIR TO GRIND COAL BY AIR-SWEPT ATTRITION, DRYING AS IT GRINDS, & DELIVERING TO THE KILN OR DRYER A FUEL SUPPLY THAT MAKES *UNIFORM* TEMPERATURE POSSIBLE

THE **STRONG-SCOTT** UNIT PULVERIZER IS BUILT TO HANDLE *ANY* BITUMINOUS COAL, REGARDLESS OF MOISTURE CONTENT, AND IS FOOL-PROOF AGAINST FOREIGN MATERIAL — WHETHER OF MAGNETIC OR NON-MAGNETIC NATURE. NO COMPLICATED DEVICES REQUIRED TO MAINTAIN CONSTANT TEMPERATURES

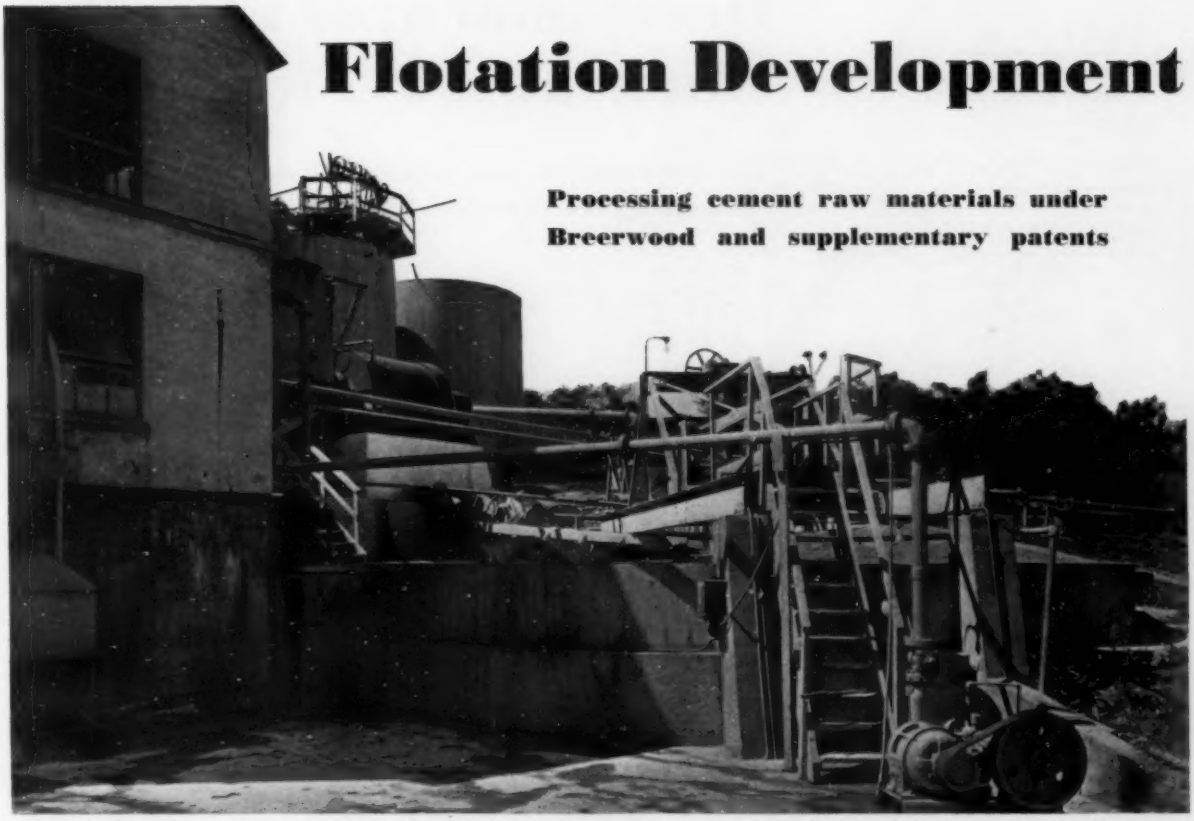
Representatives in principal cities

**THE STRONG-SCOTT MFG. CO.**

Minneapolis, Minnesota

# Flotation Development

## Processing cement raw materials under Breerwood and supplementary patents



Preliminary classification equipment at Valley Forge plant. Rake classifier is in the building at the extreme left; the pump in foreground pumps either centrifuge effluent or hydro-separator overflow to the fine calcite flotation circuit

By NATHAN C. ROCKWOOD

MANY PORTLAND CEMENT MANUFACTURERS are fortunate in being able to make the new five varieties of portland cement with a reasonably pure limestone as the chief ingredient. If the clay or shale has too much alumina the cement manufacturer may then use less of it and add silica as sand, and ferric oxide as iron ore or slag, or some other mineral containing iron.

But no limestone is really pure calcium carbonate; it contains small percentages of manganese, carbon, magnesium, tin, lead, phosphorous, sodium, potassium, sulphur, arsenic, etc. Some of these may show up in a chemical analysis as oxides, but they are present in the raw minerals as silicates, carbonates, phosphates, or what have you.

So if the cement manufacturer is to work on the assumption that he is proportioning the relatively pure minerals CaO, $SiO_2$, $Al_2O_3$ and $Fe_2O_3$, as seems to be the trend, he will have to be more concerned with extracting these necessary raw materials from the unwanted, or he will have to extract the unwanted from them. This requires a knowledge of the mineralogical character of the raw materials as well as their chemical analyses. In other words he must know the identity of the mineral constituents, the grain size and structure and the limit of grind necessary to make a desired separation. Thus, in the common argillaceous limestones, or "cement rocks," there are at least two, and sometimes more, mineral sources of each of the four essential oxides of a cement composition.

The froth flotation process of beneficiating or concentrating non-metallic ores was introduced into the portland cement industry in 1933 by C. H. Breerwood, vice-president of the Valley Forge Cement Co., and patented as a process of cement manufacture. Since then its application has been greatly extended and 15 more patents have been issued to date.

### Limestone Concentration

The original process (Pat. No. 1,931,921) contemplated principally raising the lime content of the impure limestone by froth flotation of the more easily ground calcium carbonate as the concentrate, leaving the coarser, tougher silica and related impurities as the tailings. Of present interest, is the almost equal importance assigned in the patent to the physical correction of kiln feed composition, particularly the elimination of coarse silica which "does not combine readily at normal kiln temperatures." This appears to be the first recognition in the literature of cement of this characteristic of coarse silica, and the same idea appears consistently in subsequent patents. The chemical and physical corrections were made simultaneously by separating the calcite from the siliceous minerals, present in the coarse part, by flotation, the recovered calcite then being remixed with the untreated fine fractions. Figs. 1 and 2 show the original flowsheets, which are the same except that in Fig. 1 there is a separator or classifier in the circuit which makes the split *after* the final grinding. This would necessitate wasteful fine grinding of some of the minerals to be discarded so the second flow sheet was devised (Fig. 2). These flowsheets and others referred to later in the article are grouped together, thus serving to give a picture of the

# Development of Flotation Illustrated by Flow Sheets

**References to the flowsheets and descriptions of processing are to be found in the accompanying article**

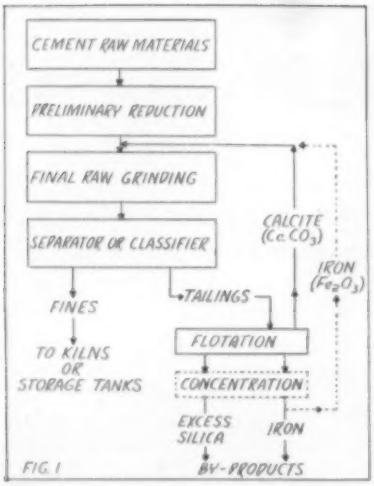



**Fig. 1: Flowsheet showing the original Breerwood process described in U. S. Patent No. 1,931,921**

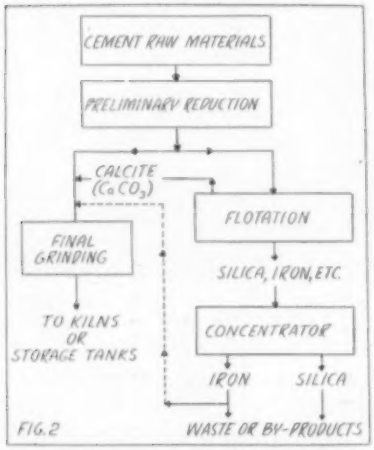



**Fig. 2: Alternate flowsheet from the original patent, using flotation before final grinding**

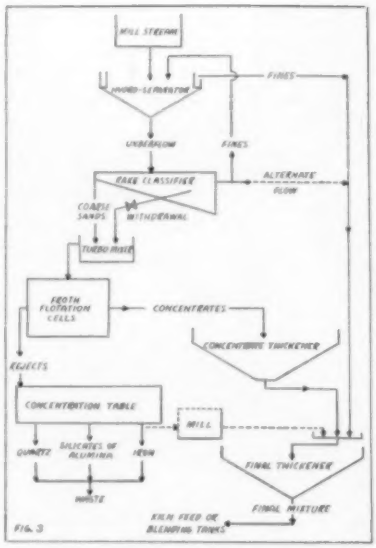



**Fig. 3: The next step in flotation after experience at Valley Forge is shown here (Pat. No. 2,028,313**

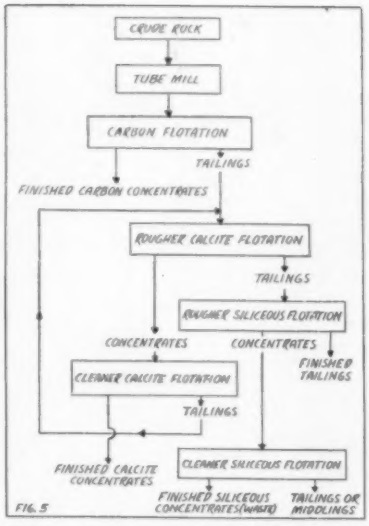



**Fig. 5: Flowsheet designed to remove graphitic carbon ahead of regular flotation, from Pat. No. 2,161,011**

**Fig. 6, below: First flowsheet in which a centrifuge was introduced, Pat. No. 2,214,716**

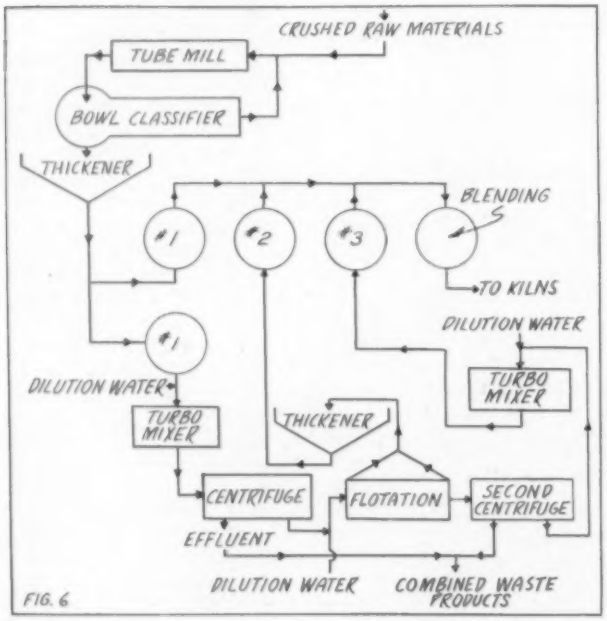
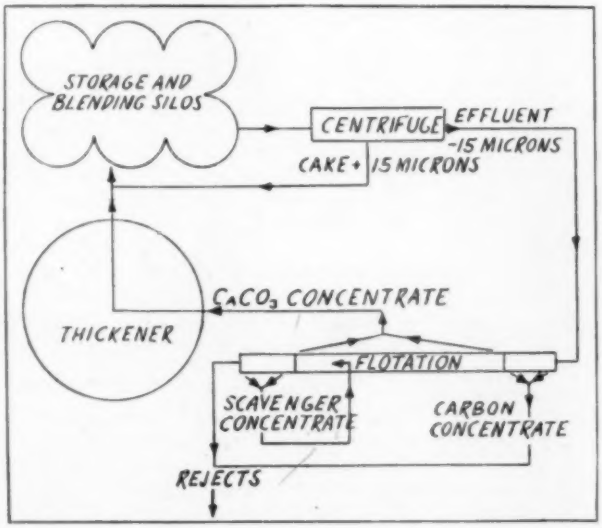



**Fig. 7, below: Flowsheet of the National Portland Cement Co. where centrifuge was first installed**



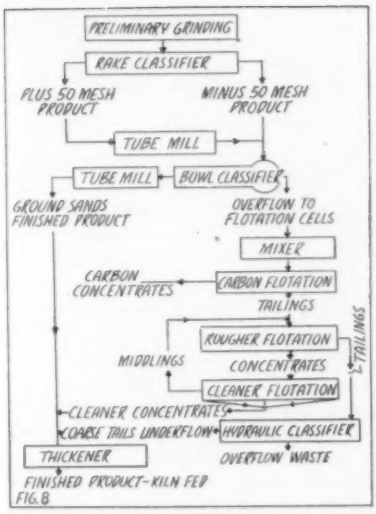



**Fig. 8: Flowsheet of the complete process, of which the National Portland Cement Co. flowsheet is a part, but uses centrifuge in place of bowl classifier**

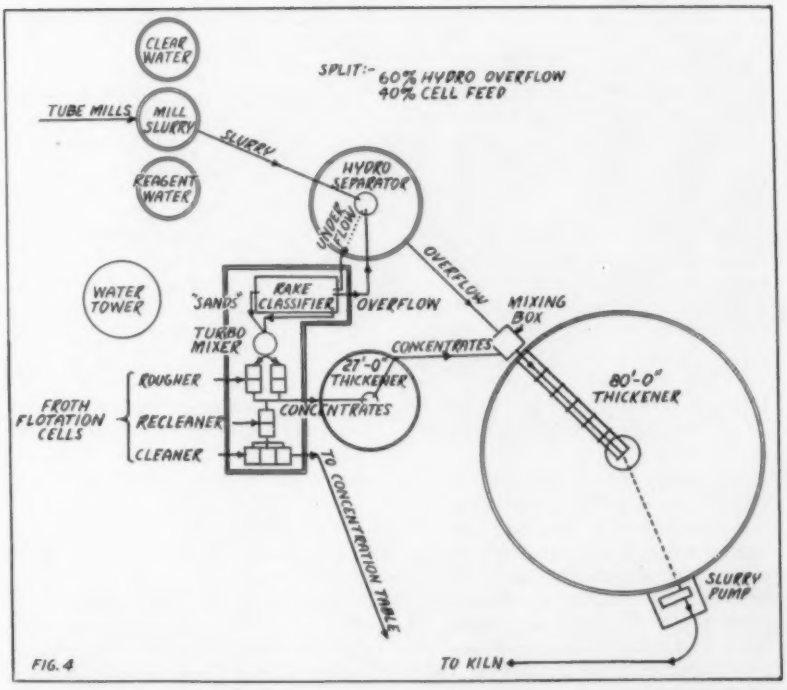



**Fig. 4: Flowsheet and general plan of the Valley Forge Cement Co. plant in 1934**

**Fig. 9, below: Present flowsheet of Valley Forge Cement Co., showing recovery of byproduct mica**

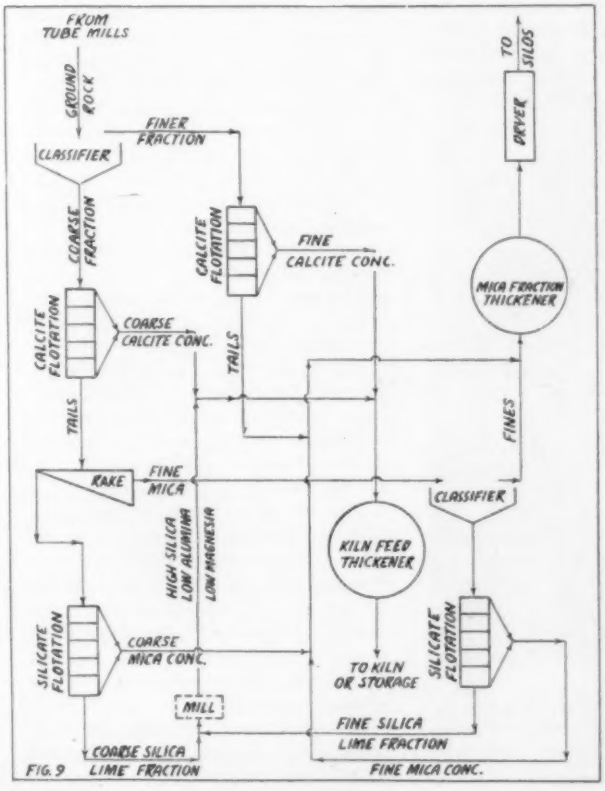
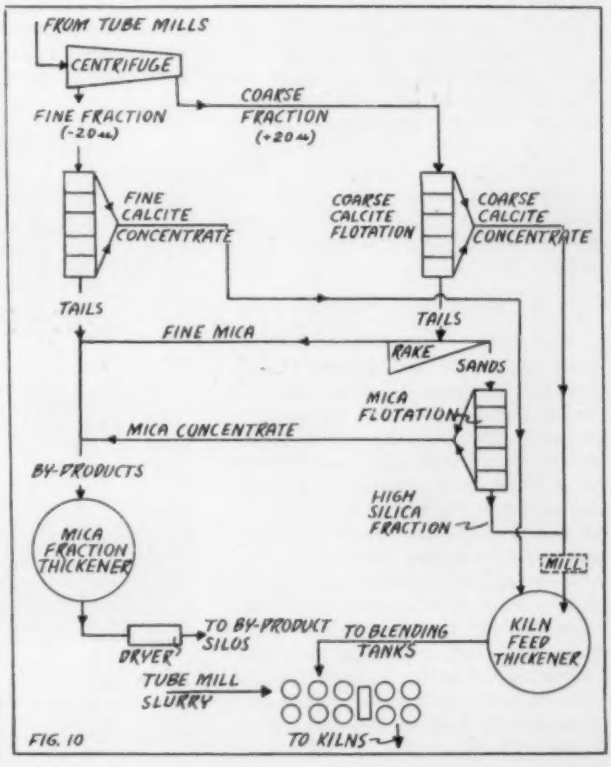



**Fig. 10, below: This is the Valley Forge flowsheet simplified for general application of the process, introducing the centrifuge for primary classification**



entire development of flotation in the cement industry.

A part of the constituents of the flotation tailings — silica and iron — could be recovered by gravity concentration and added to the mill stream if desired, especially to improve the silica ratio, either to be ground again with the limestone, or ground separately and added in blending tanks. Recovery of part of the tailings is especially desirable where the silica and calcium carbonate grains are so closely stuck together that considerable calcium carbonate will escape with the silica. It is recognized that these interlocked fine grains should be particularly susceptible to reaction in the kiln.

The next Breerwood patent (No. 2,006,939) contemplates calcining the impure limestone in sizes scalped from a secondary crusher output, and separating the excess silica and/or alumina, by hydrating the lime with a large excess of water—to a milk of lime. The calcination is supposed to be carried only far enough to drive off the $CO_2$ and to avoid chemical combination of the lime and silica and alumina. The milk of lime is added to the fines in the mill stream and the coarse silica and other impurities eliminated in bowl and rake classifiers. So far as known, this process has not been applied commercially.

The ordinary method of freeing commercial lime (CaO) from its impurities is to pulverize it and put it through an air separator with a throw-out for the coarse (silica) tailings. This method, as applied to the concentration of the lime ingredient for portland cement manufacture, is covered in Breerwood's patent No. 2,021,623 (November, 1935). This method, of course, could be applied to the dry process of cement manufacture; but there is no record of its being used.

### Valley Forge Changes

Fortunately for developing more knowledge of flotation applied to portland cement manufacture, the Valley Forge Cement Co. has in some respects a peculiar and difficult limestone to work with. It is described by G. K. Engelhart, consulting engineer of the Valley Forge Cement Co., as "a metamorphosed micaceous limestone comprising a variety of distinct minerals, principally calcite, quartz, muscovite mica, phlogopite mica, dolomite, limonite, pyrite and pyrrhotite." Hence, it was soon more apparent that simple concentration of the calcium carbonate was not the whole answer. This led to the process shown in the flow sheet, Fig. 3, covered by Breerwood's patent No. 2,028,313, January, 1936.

About this time the special "low heat of hydration" portland cements were coming to the fore, and the Valley Forge limestone presented the problem of being not only low in calcium carbonate, but high in alumina as compared with silica, or usable silica. This flow sheet was designed to employ gravity concentration on the flotation tailings, as in the original flow sheet. A concentrating table was operated for a spell, but it was found that the process would work equally well with ordinary hydraulic gravity devices, employing both a rake classifier and a hydroseparator, either separately or in combination, principally to reduce alumina by allowing mica (which contains alumina) to overflow, thereby taking advantage of the slow settling rates of mica, due to particle shapes.

The chief advantage claimed for this flowsheet is that it avoids selective quarrying; that the stone may be quarried as it comes, and by this process the final mix may be controlled without preliminary mixing or final blending. Physical correction is again emphasized and it is recommended that quartz plus 325-mesh should be absent in the kiln feed. In discussing an example, it is pointed out that the kiln feed fineness given is not equivalent to a mill stream of equivalent fineness, because the quartz is all minus 325 mesh. This is the Breerwood process as developed and used at the Valley Forge plant in 1934, first described in Rock Products, August, 1934, and subsequently by Breerwood and Benj. L. Miller in a paper before the American Institute of Mining and Metallurgical Engineers (February, 1935). The general plan is shown in Fig. 4, taken from the A.I.M.M.E. paper. It is also the flow sheet at the plant of the Parana, Argentina, subsidiary of the Lone Star Cement Corp., although no recoveries are made there from the flotation tailings, which are largely quartz.

**Close-up of centrifuge, Valley Forge; effluent discharging at the right, with cake at the left. Center tank holds mill stream storage; tank at the right is for storage of water in circulation in flotation and classification**

Sometime about in here F. L. Smidth & Co. purchased all patent rights outside of the United States, Canada, and Mexico, and has since exchanged patent rights to later inventions with the Separation Process Co., assignee of the Breerwood and related patents, in their respective territories; and in 1939 Mikael Vogel-Jorgensen, of the Copenhagen office of F. L. Smidth & Co., was granted a patent (No. 2,143,-395) for improving the flotation of slimes (the very fine raw material) by heating them to not less than 100 deg. and not over 350 deg. C., for a suitable period, before flotation. This drying out of the fine clay material so changed its character that it could be more readily separated from the calcite (or calcium carbonate) by flotation. Apparently this process has not been used on a commercial scale.

To return to the Valley Forge plant: As a result of a few years' experiments and experience, on September 10, 1937, Breerwood filed applications for several more patents, which were granted, but not in logical order (numerically) since the one granted June, 1939 (Breerwood and Williams No. 2,161,011) covered the next development or improvement in processing the Valley Forge rock. For the flotation of calcite, the collecting reagents used are the fatty acids, their soaps or emulsions, the surface active part of the reagent being the anion or negatively charged ion (fatty acid radical). Cationic reagents, in which the surface active part is in the positively charged ion, had just been discovered as collectors of acid (siliceous) minerals, but in the suggested quantities and methods of use they were ineffective for separating the constituents of argillaceous limestones, collecting the siliceous minerals as a group together with the calcite. Breerwood and Williams discovered (Patent No. 2,161,010) that by using them in extremely small quantities fed in successive increments to a series of flotation cells, the aluminum and magnesium silicates could be concentrated by froth flotation from the quartz, unbroken rock, ferric oxide and calcite, which would remain as tailings.

Cationic flotation (mica concentration) circuit handling sands or underflow of rake classifier. There are two rows of 36-in. Fagergren cells each

Interior of cell house at Valley Forge. Coarse fractions are divided into equal parts and flow respectively to the first cell of each row of 66-in. Fagergren machines

The Valley Forge rock contains relatively little graphitic carbon, but carbon is a common constituent of argillaceous limestones; for example, it is present in the Lehigh Valley cement rock in proportions ranging from 0.5 to 1 percent, giving this rock its characteristic color. Even in these small quantities, it interferes with successful flotation both by tending to flocculate other fine mineral grains, so that separation is difficult, and by adsorbing entirely disproportionate quantities of both classes of collecting reagents. The presence of graphitic carbon in the Lehigh Valley cement rock was among the reasons why other flotation experts were of the opinion that this rock was not amenable to froth flotation.

Two solutions to this problem are given in the Breerwood patents. The flow sheet which accompanied the Breerwood patent No. 2,161,011 is shown in Fig. 5, in which a preliminary concentration of the carbonaceous matter is made, followed by the concentration and removal of the aluminum and magnesium silicates. The same idea is advanced in Breerwood patent 2,144,254, in which the concentration of carbon is followed by the concentration of calcite, the method adopted at the plant of the National Portland Cement Co. The second solution is to depress the graphitic carbon by the use of agents, particularly calcium or sodium lignin sulphonate, as covered by Breerwood's patent No. 2,130,574, the process of this patent also having been found effective for the recovery of metal sulphides and gold from carbonaceous ores.

### Differential Flotation

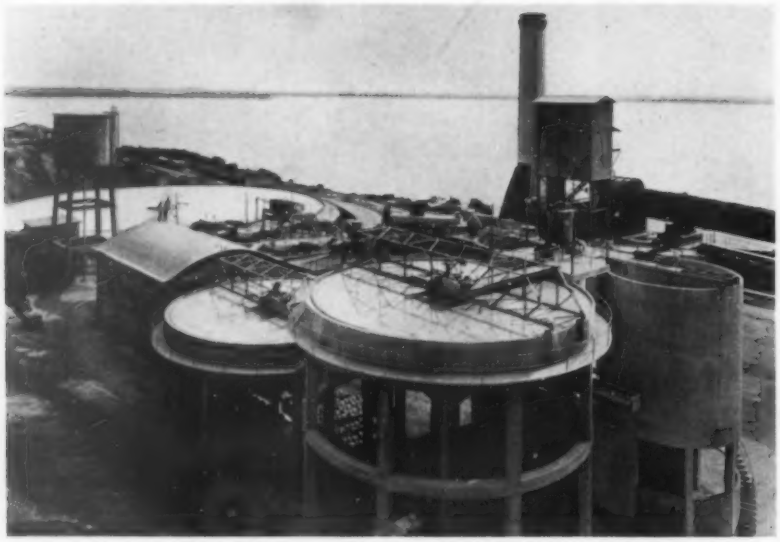
The solving of this problem of *differential* flotation was a most significant advance in the art of flotation, and one that probably can be made of much service in the application of froth flotation to other non-metallic mineral industries. Breerwood's process (in the words of the patent specification No. 2,161,011): "succeeded in effecting differential concentrations in the following order; first, the aluminum and magnesium micas; second, the feldspar minerals; third, crystalline silica, particularly quartz, without concentrating a substantial part of the remaining free calcite grains in the froth. The practical significance of this discovery will be understood if it is remembered that the more common raw materials are excessive in alumina, and usually excessive in silica; and when present in substantial proportions magnesia is an undesirable adulterant. Thus a very limited concentration of the total weight of the remainder of the pulp, subjected to the second flotation operation, effects the desired reduction of alumina; and as it occurs as a silicate, the total silica is necessarily reduced in the recovered materials."

"Particularly when magnesium mica is present, this concentration effects desirable reductions in alumina, silica and magnesia; talc, being a silicate, is also concentrated, retaining in the tailings the calcite and the usually desirable crystalline silica. Iron oxides tend to concentrate, but, as the collecting power of the positive ion reagents (cationic) is relatively low with respect to the oxides of iron, as well as calcite, froth cleaning by flotation, without the addition of collecting reagents, is effective in increasing the recovery in the flotation tailings. The unbroken rock particles are not as amenable to concentration, in the presence of these reagents, as the crystalline silica, and can accordingly be retained in these tailings."

The processing described in patent No. 2,161,011 was not substituted for the older processing at Valley Forge, but superimposed on it, so as to utilize gravity concentration as far as possible. This was done by first floating the calcite from the coarser fractions as in the original flowsheet, which relieved a large part of the load from the cationic reagent circuit, and reduced further the amount of reagent otherwise required, since the calcite itself will use up part of the reagent. By allowing the fine mica to overflow a classifier that receives the tailings of the calcite flotation a substantial part of the mica is removed, and the mica concentrate of the subsequent flotation process removes the rest.

This feature of the process is covered in Breerwood's patent No. 2,162,-525, June 1939, one of those applied for on September 10, 1937, already referred to. This patent also covers the use of a dispersing reagent to make possible the flotation of very finely ground raw material (pulp). These are usually so finely ground that to mining men they are "slimes," and slimes, according to mining engineers, cannot be separated into their mineral constituents by froth flotation. The dispersing (or deflocculating) reagents recommended in this patent are calcium lignin sulphonate and sodium lignin sulphonate.

The knowledge gained in the use of dispersion reagents for flotation of "slimes" led to further improvements in processing at Valley Forge by subjecting the classifier overflow, all minus about 325-mesh, to flotation to recover as a concentrate the calcite that would otherwise have been wasted with the mica and clay fines which overflow with it. This successful flotation of fines in Fagergren cells is an outstanding contribution to the art of froth flotation and was accomplished in spite of the predictions of "flotation experts" that it could not be done. This feature is



**Raw material processing plant of the Parana, Argentine subsidiary of Lone Star Cement Corporation**

the subject of Breerwood's patent No. 2,144,254 applied for September 10, 1937, and granted January 17, 1939.

This patent, No. 2,144,254, was especially directed to the practical processing of extremely fine grained argillaceous limestones, of which the Lehigh Valley cement rock is an excellent example. Some of the same experts published a statement that successful flotation concentration would require grinding to all "minus 1500 mesh." This rock is usually deficient in both calcite and quartz, but contains excessive proportions of aluminum silicates. The maximum size of siliceous grains is about 20 microns. When ground to normal raw material fineness, the particles coarser than 20 microns are largely calcite and unbroken rock particles of calcite and quartz. It is true that separations cannot be made from the fractions plus 20 microns, but the patent shows that there would be no point in resorting to finer grinding, because by separating the coarser from the finer fractions, the former are necessarily of increased calcite and quartz content, i.e., of higher silica ratio, and the constituents, calcite and quartz, in the unbroken rock particles are fine and in perfect contact for reaction during burning.

It was contemplated that preliminary classification into fine and coarse parts would result in a coarse fraction of improved composition and a fine fraction in which the principal chemical correction could be made by froth flotation, the recovered concentrates being mixed with the coarser fractions to form the kiln feed or the major part of the mixture. This obviously limited the tonnage fed to the flotation cells. The patent refers to the use of dispersers, the feature of patent No. 2,162,525, and also to the depression of graphitic carbon, the process of patent No. 2,130,574 as an alternative to the preliminary concentration of carbon. This process is essentially that in use at the plant of the National Portland Cement Co., although the patent flow sheet is somewhat more elaborate.

At about the same time Breerwood was experimenting with dispersing reagents and flotation reagents to concentrate calcite from slimes, Vogel-Jorgensen, of F. L. Smidth & Co., Copenhagen, was also perfecting flotation of slimes and was granted patent No. 2,165,268 for use of an aqueous solution of a substantially completely pre-saponified acid-refined talloel and aerating the pulp, or the talloel and a fatty acid, in an aqueous solution (the Fagergren cell is an agitating and aerating device).

It is this Vogel-Jorgensen type of reagent that is used at the Permanente Corp. plant, where the raw material processed is a limestone below cement composition because of impurities in the form of silica as quartz, chert or flint. The same problem was met at the Parana plant of Lone Star in the Argentine. At both these plants, some but not all of the limestone is too high in silica to be corrected by the mere addition of purer limestone and alumina. Both operations are very similar to the original processing at Valley Forge, and are representative, probably of the most common problem in using impure limestones as the prime raw material.

Two patents were issued to Robert C. Ried, of the Valley Forge Cement Co. (assigned to the Separation Process Co.), Nos. 2,163,701 and 2,165,268 in June and July, respectively, 1939, for flotation reagents, which illustrate the extent and thoroughness with which the whole field was explored in 1936 and 1937.

### Enter the Centrifuge

The next important step was the use of a centrifuge in place of gravity separation by the hydro-separator in the original flow sheet at Valley Forge (Fig. 3).

The centrifuge is familiar to chemists. It is much used in chemical processing industries. By whirling or whipping (as in a cream separator) a suspension of fine solids in a liquid medium it throws the solids out tangentially or horizontally with many times the vertical force that gravity could act on them. Hence the heaviest particles are thrown farthest and form the "cake"; the light (or fine) particles, the relatively coarser flakes of mica of low settling rate and most of the liquid form the "effluent." By varying loading, dilution and speed, the centrifuge has remarkable range in making separations by particle size and density. Its use in the process is covered in Breerwood's patent No. 2,214,716, applied for in June, 1939, and issued September, 1940. The explanatory flow sheet is shown in Fig. 6.

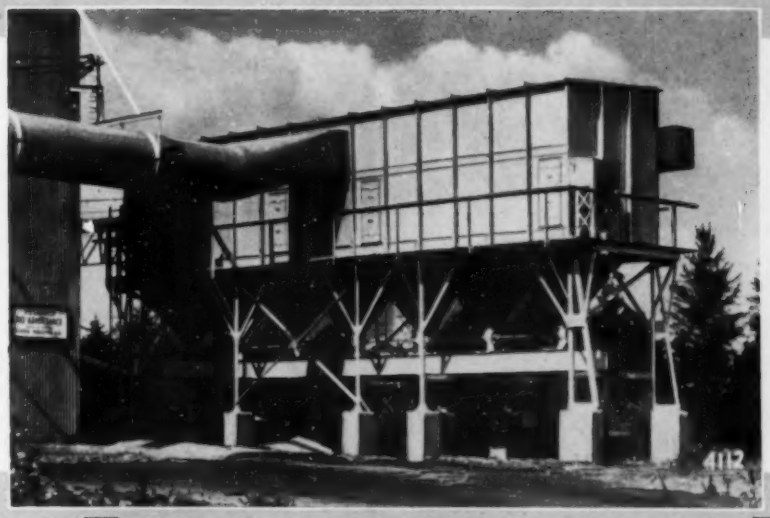
The centrifuge thus provides the fine and coarse fractions for the two calcite flotation circuits, but its principal purpose at Valley Forge is to make the classification in a smaller particle size range, first to increase the proportion of silicates in the fine fractions; and second, to increase the proportions of both calcite and quartz in the coarse fractions, the quartz being ultimately recovered in the tailings of the cationic reagent flotation; and third, it removes the colloidal slime from the coarse fractions, thereby enabling the flotation circuit handling these coarse fractions to give better results. By forcing substantially all of the fine quartz into the cake, the recovery of quartz as a tailing of cationic flotation is sufficient to enable the manufacture of A.S.T.M. Type 2 and Federal Specification SS-C-206 cement without adding sand to the ultimate mixture, which would be necessary if the classification was made by a gravity classifier.

The National Portland Cement Co. is the first to use the centrifuge in this way (Flow sheet, Fig. 7). Here the carbon (graphite) is also being concentrated ahead of the calcite concentrating cells, as described in pat-

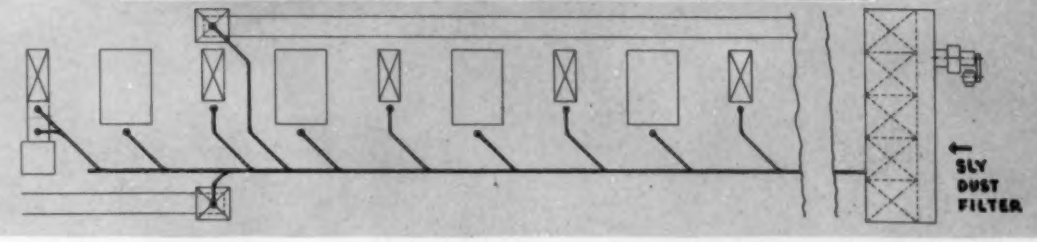
*(Continued on page 64)*

•Inexpensive Insurance Against Health Hazards

# SLY DUST CONTROL



*Sly Dust Control at the Staso Milling Co., Pembine, Wis., producers of granulated roofing stone.*




This Sly Dust Filter in a stone crushing plant is connected by a suitable system of piping to the various sources of dust—crushers, screens, conveyors and elevators.

The dust-laden air is drawn into hoods at these points, thence through the piping into the filter where the dust is filtered out and easily disposed of—resulting in a clean plant and protection to employees in both health and safety.

The exclusive advantages offered by Sly Filters are: (1) *Greater filtering capacity* because of more filtering cloth. (2) *Taut bags* at all times, saving power and resulting in quicker removal of dust. (3) *Bags* more easily replaced. (4) *Automatic control* (any degree) minimizing or removing the human factor. (5) *Simpler shaker mechanism* resulting in savings in maintenance and operation.

Hundreds of companies have found that Sly Dust Control soon pays its cost by improved efficiency of workmen, savings in wear and tear on machinery and improved quality of products. Write us fully so that we can tell you just what can be accomplished in your case.

That the advantages of Sly Dust Filters—their savings in space, power, and maintenance—are widely appreciated in the Cement Industry is evident from the fact that Sly is a 4 to 1 favorite in this industry.

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SLY
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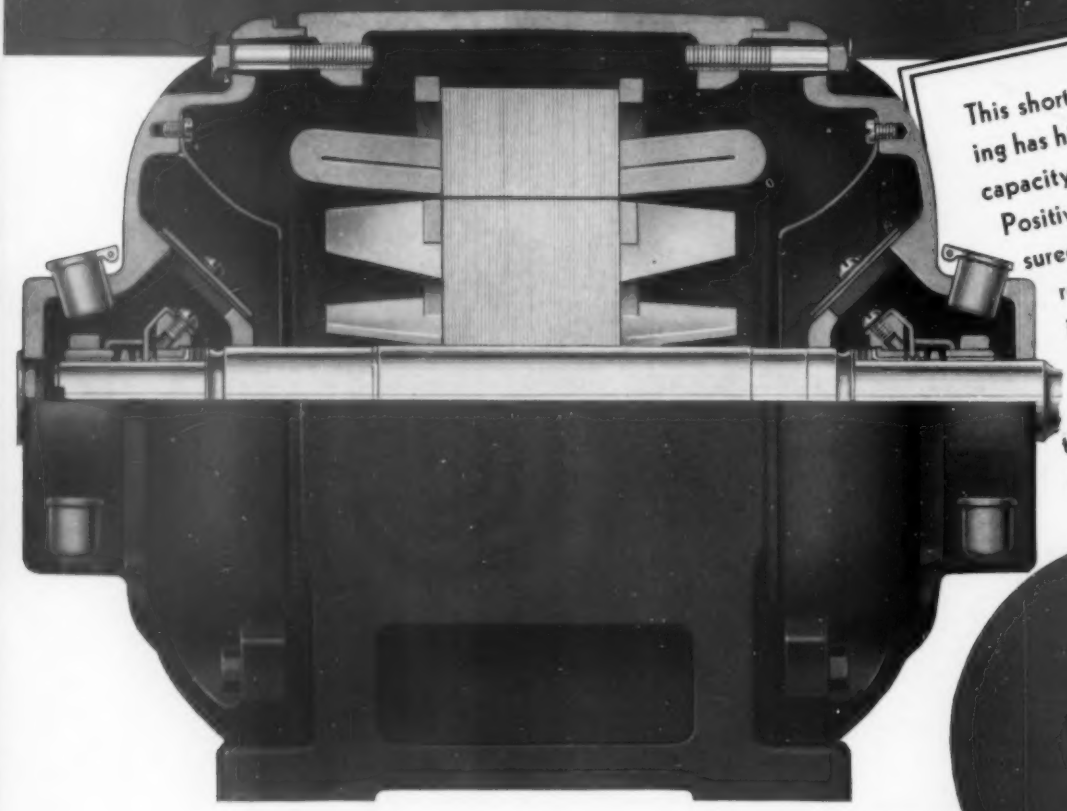
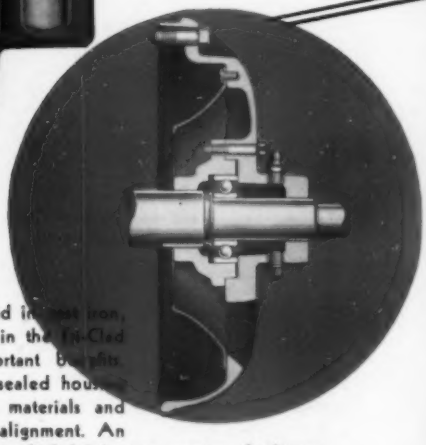


This shortened sleeve bearing has higher load-carrying capacity and longer life. Positive lubrication is assured by its corrosion-resisting oil ring and improved spiral grooving—the bearing runs full of oil regardless of the direction from which the load is imposed.



*Built for protection first...*
*...to last!*

Completely housed in cast iron, the ball bearings in the Tri-Clad motor offer important benefits. The single-joint, sealed housing excludes foreign materials and maintains proper alignment. An improved pressure-relief lubrication system facilitates getting fresh grease where it is needed and helps to expel worn-out grease.

**TRI CLAD**
**INDUCTION MOTOR**
**GIVES EXTRA PROTECTION 3 WAYS**

### *Extra Protection*
**against physical damage**

The strong, one-piece cast-iron frame and end shields, with upper portion completely enclosed, protect vital motor parts from external blows, flying chips, settling dust, and dripping liquids.

# When We Cut

## THE ENDS OFF THE BEARINGS

**In the Tri-Clad motor, G.E. uses a SHORTER sleeve bearing for LONGER life**

### Extra Protection

**against operating wear and tear**

For years, G-E motor designers have been experimenting with sleeve bearings of all kinds. They have found that a shorter sleeve bearing—one with new diameter-to-length proportions and a more effective type spiral grooving—is a fundamentally better bearing: that such a bearing can successfully withstand the stress imposed by short-center, hinged-base drives and similar applications.

In addition, the new sleeve-bearing housings on Tri-Clad motors are dust- and oil-tight. These and many other features are your assurance of a dependable, free-running motor.

In Tri-Clad ball-bearing motors, the bearing is completely enclosed in cast iron. There are only three major parts in the bearing assembly—the end shield, the inner cap, and the bearing itself. Close-fitting running seals keep out ball bearings' worst enemies—dust, dirt, and water.

You'll find that Tri-Clad motors are usually quiet and smooth-running; you'll find that they stay on the line when the going is tough. They'll give your production *extra protection* during *extra* years of service. Specify them on your next motor order. General Electric, Schenectady, N. Y.

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# Making Better Cement

**Completely rebuilt Union Bridge plant of Lehigh Portland Cement Co. replaces 24 small grinding mills with four; waste heat power generation cuts coal consumption 60 lb. per barrel**

Storage area for crushed raw materials on left; crushing plant, center, showing vibrating screen with piping to dust collector; quarry train to the right

PRACTICALLY all the modern concepts of portland cement manufacture, from the quarry to the finished product, have gone into the design of the Union Bridge, Maryland, plant of the Lehigh Portland Cement Co., which has been entirely rebuilt. This plant was re-constructed not to increase capacity—in fact its present potential production is less than it was—but to improve the quality of the cement manufactured and to lower the overall unit mill cost of production.

Union Bridge is a dry process plant and manufactures standard portland and modified (type II) cement. It has five 8- x 120-ft. rotary kilns which can produce 3500 bbl. of clinker in a day. A sixth kiln was dismantled when the plant was rebuilt.

### Unit Coal Mills Replace Central Coal Grinding Plant

In grinding, both raw material and cement, the dismantled equipment was limited in its ability to grind to needed finenesses. Raw material was ground in 13 small mills which operated in open circuit. These have been replaced by a single mill, which dries as it grinds, and which is closed-circuited with a mechanical air separator. Cement was ground in 11 small mills which were incapable of grinding to as fine as 90 or 92 percent through 200-mesh without a great sacrifice in production and unit cost.

As surface area requirements have increased, the finish mill could no longer keep pace with the rest of the plant. These mills have been displaced by a single preliminary mill in open circuit followed by two large tube mills closed-circuited with two mechanical air separators which together have far greater capacity at the greater finenesses. Thus, the grinding departments together have four large units as compared to 24 in the plant of a few years ago.

The kilns have not been changed, but they are now fired by unit coal mills which replace a centralized coal grinding plant that had four grindings mills, and fed the coal into each kiln by individual blowers. From an operating cost standpoint, the most significant addition to the plant is in power generation. Union Bridge is

Trainload of stone being dumped at crushing plant. Note Diesel-electric locomotive

one of the few plants to install new waste heat boilers in recent years for power generation. In addition to its peak requirements, this plant produces surplus electrical power which is used by the local power company. Electric power was formerly generated by coal-fired boilers, with a fuel requirement of 60 lb. of coal for each barrel of cement produced, and the heat in the kiln exit gases went to waste out the stacks.

Induced draft has replaced natural draft and fans have been installed to draw the gases through kilns, boilers, new heat economizers and cyclone dust collectors in that order. Better control of kiln firing through the use of unit coal mills, induced draft and instrumentation have combined to lower the fuel ratio from 100 lb. to 88 lb. to a barrel of cement, which with the 60 lb. needed to generate steam for power in the old plant is a saving of 72 lb. to a barrel.

A new crushing plant has been built, Diesel-electric locomotives have been substituted for steam equipment for quarry haulage, modern quarry cars have been purchased, electric shovels replace steam equipment and the plant is well-equipped with dust arrestor equipment throughout. Other major improvements are 65,000 bbl. of added cement storage to better meet the demands for test bins, new mixing bins for improving the raw material composition and modern proportioning equipment for grinding control.

The entire plant is highly instrumentalized, for regulation of all moving machinery and for measuring performance. It has many automatic indicators and features such as interlocking electrical controls to auto-

General view of plant. Blending bins may be seen on the right, and maintenance buildings in the foreground

# At Less Cost

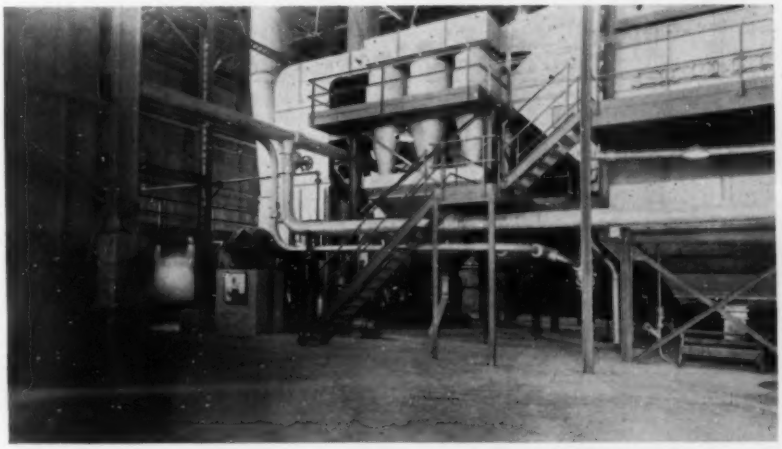
By BROR NORDBERG

Overall view of firing floor, showing five direct-firing unit coal pulverizers

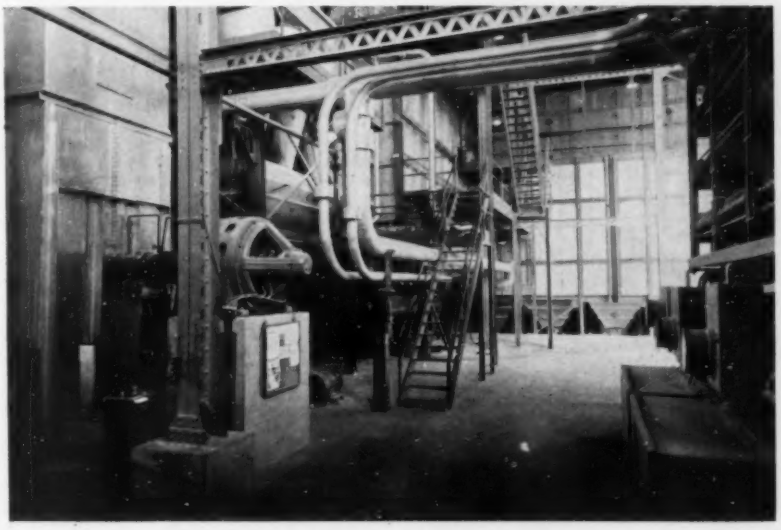
matically stop feeding equipment whenever a machine stoppage occurs ahead.

### Quarry Improvements

The quarry, located ¾ mile from the plant, has a one-way circular loop of standard gauge track and two 150-hp. Diesel-electric locomotives for hauling quarry cars to the crushing plant. Limestone is actually a marble, testing as high as 99.5 percent $CaCO_3$. It is drilled with 6-in. well drills and excavated by a 2½-cu. yd. electric shovel. Haulage equipment consists of 25 new 12-ton side-dump, roller bearing equipped quarry cars, which are dumped at the crusher by a pneumatic lift. Six cars make up a train.



A battery of cyclone stack dust collectors, induced draft fan on left with waste heat boiler and economizer on the right



From left to right, draft fan, cyclone dust collectors, economizer, and waste heat boiler with 9750 sq. ft. of heating surface

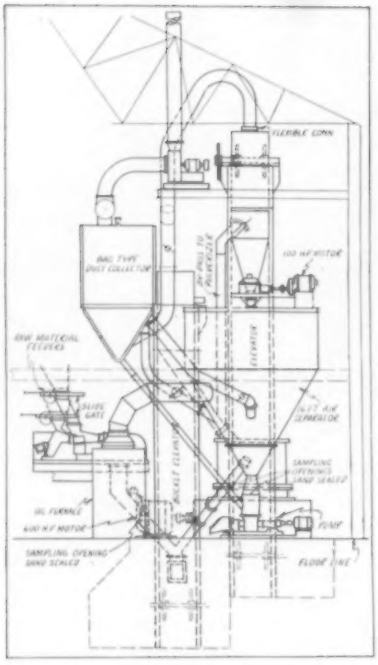
Shale, obtained from a deposit adjoining the trackage midway to the plant from the quarry, is loaded into cars by a 1¾-cu. yd. electric shovel. The source of additional silica is a sandstone deposit three miles away. Sandstone is trucked to a ramp overlooking the shale quarry, is dumped into that quarry and is then loaded into quarry cars.

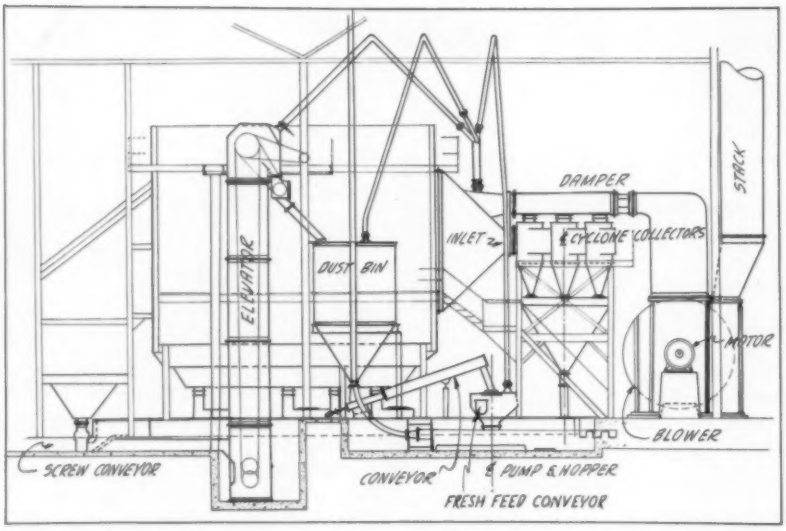
Since the electric shovels, larger quarry cars and Diesel-electric locomotives went into operation, 40 hr. of quarry production are sufficient for the cement plant needs, larger stone is hauled and there is more uniform service to the crushing plant.

Stone dumped into a hopper is fed out to 36- x 60-in. crushing rolls by a 5- x 16-ft. pan feeder. These rolls have knobs and discharge a 4- to 6-in. maximum size stone into the boot of a continuous bucket elevator. Final reduction to a 1-in. top size for grinding is accomplished through a reversible hammer mill, closed-circuited by a bucket elevator with a 5- x 8-ft. single-deck enclosed vibrating screen. This mill has a capacity of 300 tons per hour, is driven by a 350-hp. electric motor and receives returns (plus 1-in.) from the vibrating screen over a belt conveyor. Minus 1-in. stone discharges from the screen into a new covered storage area of 15,000 tons capacity.

### Recover Crusher Dust with Bag Type Collector

Dust gathered from the crushers, their discharges and from the enclosed screen through ducts is collected by a new bag-type dust collector and returned by screw conveyor into the bucket elevator feeding the vibrating screen.

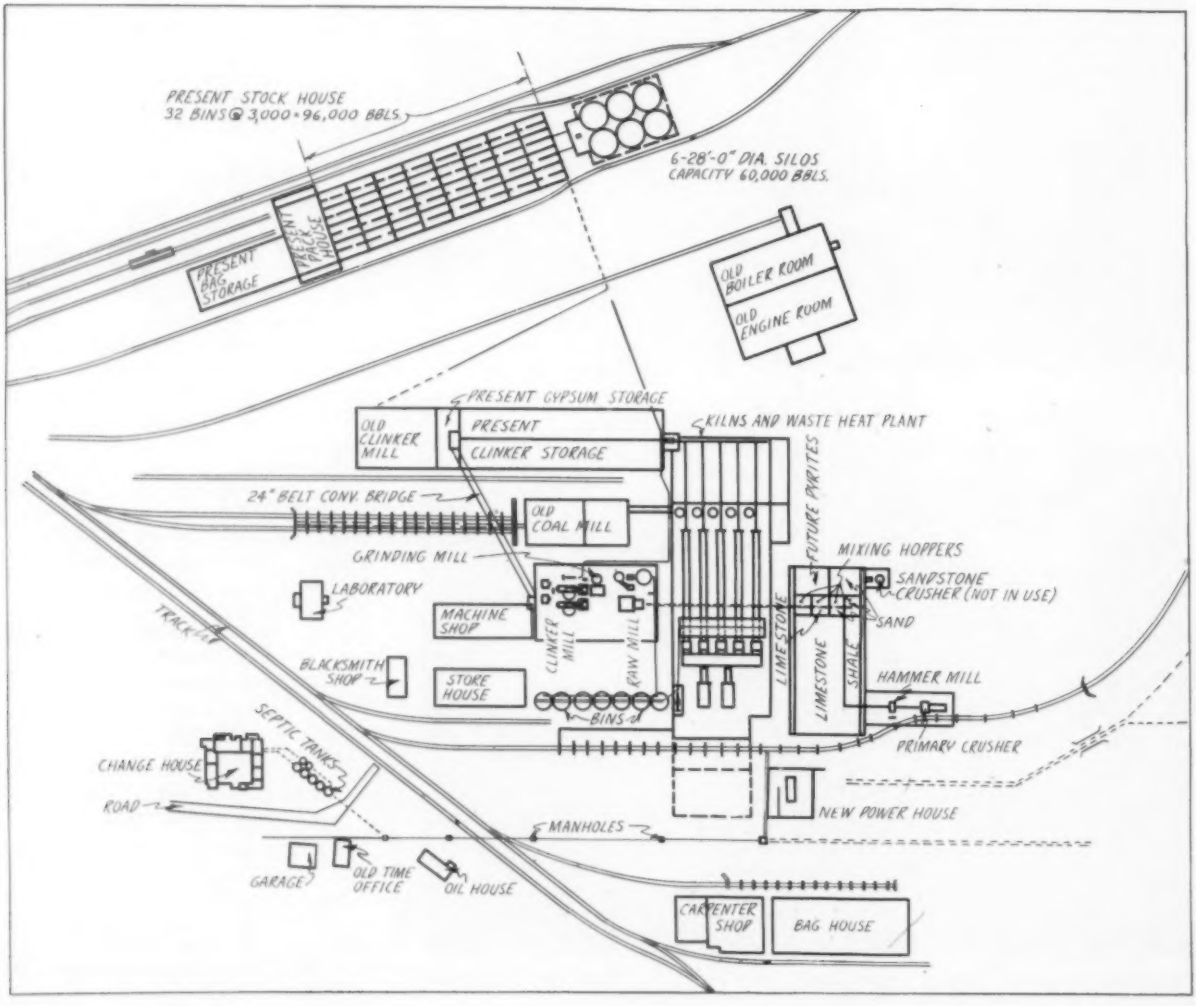



**Left: Arrangement for grinding raw material in closed-circuit. Heated air circulated through system dries materials as they are ground**

**Above: Sectional elevation showing how stack dust is blended into the fresh kiln feed stream. On right is the stack dust collector**

**Below: General layout of the entire plant showing the principal mill buildings. Tracks (right) lead to quarry**



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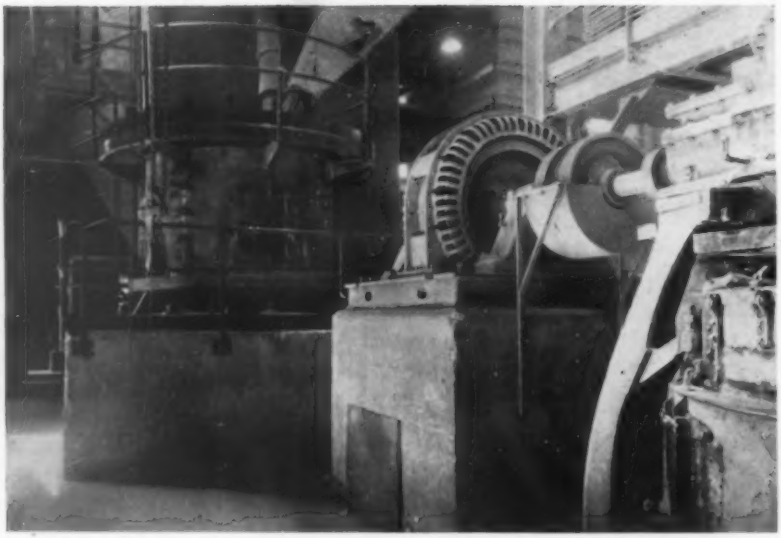
"PENNSYLVANIA" REVERSIBLE Hammermill making the secondary reduction of hard raw cement-making materials, to efficient size for grinding, in large Pacific Coast Cement Plant.



**All raw material is ground with this unit pulverizer. The mill is in closed-circuit with a 16-ft. air separator and the system drys while grinding. Feed elevator, piping, and air separator are insulated and receive heat from a hot air furnace**

Shale and sandstone are handled separately through the same crushing and sizing equipment. An 8-ton overhead electric crane with a 3-cu. yd. bucket handles the materials into storage and reclaims them into mixing bins where approximate proportions are realized before delivery to the raw grinding plant.

These bins are located in the storage area and consist of two stone bins, a shale bin and a sandstone bin in a row from which the materials are reclaimed by pan feeders to a single belt conveyor delivering to the raw mill feed bins. Sand and shale, as well as iron ore when needed, are proportioned separately at the mixing bins on to the belt for delivery by a bucket elevator into one 90-ton steel feed bin for grinding. Stone is handled separately by the belt to the same elevator and delivered to a 230-ton steel mill feed bin.

Before the plant was rebuilt, some blending was done at the crusher by dumping a certain number of cars of each material. However, the plant was equipped with the first blending bins in an American cement plant, back in 1913, and these bins served to correct the kiln feed. These bins have been retained for adjusting and blending raw material as it comes from the grinding mill.

### Raw Material Grinding

All the raw material is ground by a single unit pulverizer and the relative proportions of limestone to shale plus sandstone (and sometimes iron ore) are regulated by separate electro-magnetic constant weight feeders under each feed bin. Proportioned feed materials are elevated by an enclosed bucket elevator which discharges into the mill.

Discharge from the mill is elevated by an enclosed bucket elevator into a 16-ft. mechanical air separator. Rejects return into the feed bucket elevator and the fines are pumped by an 8-in. type H Fuller-Kinyon cement pump into either of seven 400-ton circular blending bins, which serve also for storage. Circulating loads as high as 1000 percent are carried in the grinding unit.

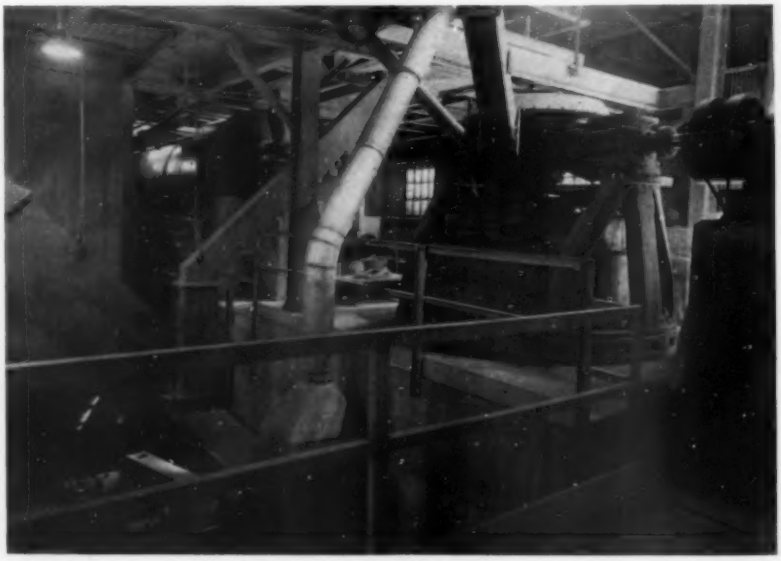
This grinding circuit has automatic overload electric controls to retard and speed up the fresh feed as the circulating load builds up too high. Variable speed drives on the feeders are the means of proportion control, at the discretion of the plant chemist. Variations of the belt speed on either feeder can be made to change the relative proportions of each material fed to the grinding mill. Capacity for ground raw material averages about 40 to 45 tons per hour, with a fineness of 92 to 95 percent passing 200-mesh. Sixteen to 18 hours of raw mill grinding will produce the requirements for four kilns, which usually are in operation. A 600-hp., 2200-volt induction motor drives the mill.

### Dry While Grinding

Separate stone drying equipment is no longer necessary, since the mill grinding circuit is equipped for drying simultaneously while grinding. The bucket elevators are insulated by a concrete encasement, and the air separator and ducts are insulated by asbestos covering, with a heated air stream from an automatic oil-fired hot air furnace circulated principally through the air separator as well as the bucket elevators and the mill.

The intake of heated air into the circuit is governed to maintain a raw material discharge temperature between 150 deg. F. and 175 deg. F.; the higher figure for wet, cold quarry conditions. Raw material as it discharges into the cement pump is dried to 0.2 percent moisture. Samples for fineness and composition are taken at the pump at regular intervals by an automatic sampler. Dust generated in the mill and elevators is collected by a bag-type collector and returned into the bulk material pump.

Blending silos have a total capacity of 2800 tons in seven units. Under



**Preliminary mill on clinker grinding. One of the finish mills may be seen in the background**

# STURTEVANT

## AIR SEPARATORS

*Selected by*

**THE CEMENT INDUSTRY**

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**There is a very strong reason why the number of Sturtevant Air Separators in the cement industry is steadily increasing. Sturtevants have shown themselves to be perfectly suited as the profitable means of separating finer meshes to meet present specification demands.**

**Because of the increased surface areas required for cements many plants are finding it difficult to manufacture profitably under existing arrangements. All installed Sturtevants on approval—all found them to be perfectly suited to their plant design. The mills have reduced the number of units needed to manufacture a higher quality product and have increased separation capacity.**

**Let our engineers show you how Sturtevant separators can make it easier for you to manufacture higher tonnages of quality product at lower unit costs.**

**FOR**

- Controlled specific surface area
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- Increased mill capacities (in some instances by 300%)
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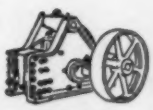
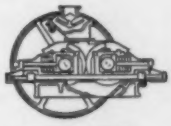
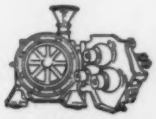


Jaw Crushers

Rotary Fine Crushers



Crushing Rolls



Ring-Roll Mills

Moto-Vibro Screens

Swing-Sledge Mills

**STURTEVANT MILL CO. HARRISON SQUARE BOSTON, MASS.**

Bag-type dust collector which gathers dust from the crushers, sizing screen and handling equipment in the stone plant

each bin are two rotary feeders, a total of 14 in a row, which withdraw the raw ground material into a common screw conveyor feeding a 10-in. F-K pump which pumps the material into any of the five kiln feed tanks. These tanks have a combined capacity of 1000 tons. By withdrawing kiln feed material from various combinations of bin gates, blending is accomplished. Provision is made to circulate material by pump between bins for further correction if required by the plant chemist.

### Direct Fired Kilns Through Unit Mills

Each kiln is fed raw material from its individual feed tank by an inclined feed screw and a kiln feed pipe. The old plant had a central coal grinding plant with four mills and pulverized coal was stored at the firing end of each kiln to be blown through the burner pipes by individual fans.

Each kiln is now fired by an improved type unit pulverizer which dries as it grinds and injects the pulverized coal into the kiln as it is ground.

Primary air entering the unit mills for drying is kept between 150 deg. F. and 200 deg. F. by damper controls in the piping from each kiln hood. Ordinarily, it is desired to closely approach 150 deg. F. to have a longer flame in the kilns. Secondary air is from 70 to 75 percent of the total, and is drawn from the clinker drag tunnel, where the clinker is cooled from a red heat to a dull red. Each direct-firing mill is equipped with a small individual air compressor which serves to keep all the ball bearings free from dust. Feed coal is a West Virginia ¾-in. top size slack with an average heat value of 12,500 B.t.u.

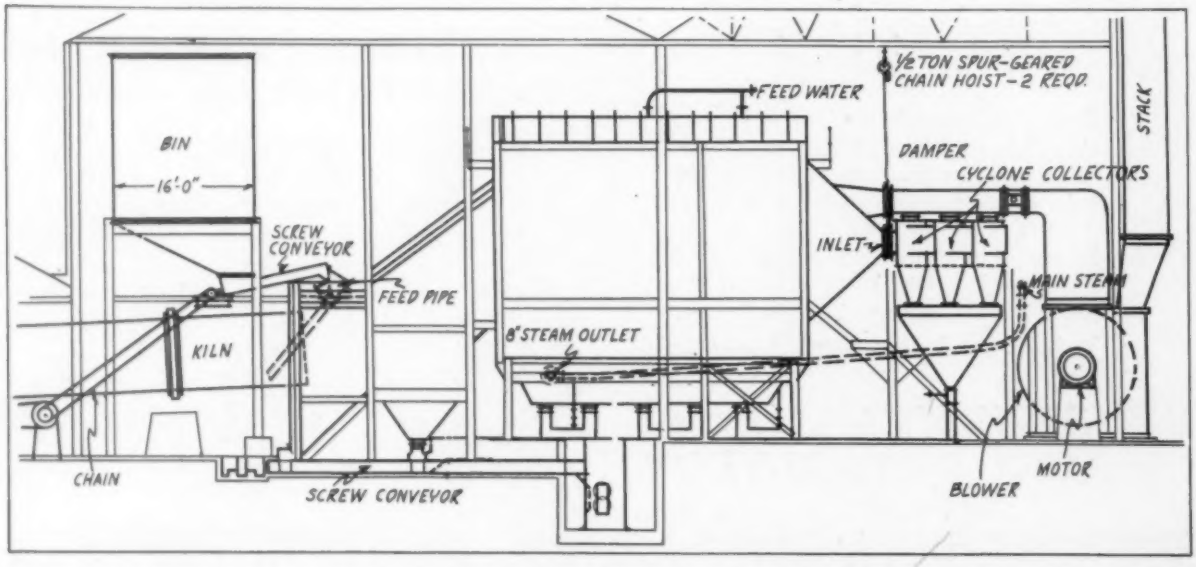
### Waste Heat Boilers Provide Surplus Power

Union Bridge is now more than self-sufficient in electrical power produced entirely from one of the most efficient waste heat boiler installations in the cement industry. At the exhaust ends of the kilns, kiln gases with a temperature of about 1400 deg. F. enter a common flue and are then pulled through two waste heat boilers. A 147-in. diameter induction fan draws the gases first through the boilers, then through the economizers, and new stack dust collectors, and each unit exhausts through its stack at 320 to 350 deg. F.

Each of the two boilers is of the 3-drum type with 9750 sq. ft. of heating surface, and is designed to develop a steam pressure of 450 p.s.i. Each economizer is rated for 500 p.s.i. pressure, and has a heating surface of 5300 sq. ft., while each of two 5-loop superheaters has a heating surface of 1800 sq. ft.

The power plant comprises a 3000 kw., 80% P.F. Curtis turbine-generator set driven at 3600 r.p.m. by steam at 400 p.s.i. and 750 deg. F. of temperature to develop alternating current at 2300 volts. An evaporator and a deaerator unit is used to remove free air from the condensed water for the waste heat broilers.

Under normal operation, the average power load is 2000 kw. with the power plant developing 2700 kw. Ex-




Elevation drawing of one of the waste heat boilers showing, left to right: the kiln feed mechanism, waste heat boiler with economizer, stack cyclone dust collectors and the induced draft fan

# DUST is a problem in industry, too!

DUST spells work for the housewife. And it is a pesky problem in industry, too. Whether it represents a nuisance or a loss of valuable materials in your plant, there's a practical, inexpensive answer. And American Blower has it!

Let us show you how we have successfully solved many dust problems similar to your own with the famous American Blower Type "D" Centrifugal Collector (illustrated on left, below). Let us work with you in selecting and installing the modern American Blower equipment best suited to your particular needs.



*A typical American Blower Type "D" Centrifugal Collector installation, above. Investigate this time-proved, practical equipment for your own dust problems now!*

Our Dust Testing Laboratory at Detroit is available to engineers and customers for testing and analyzing dust samples. Phone or write the American Blower Branch Office nearest you for complete data. Investigate, too, the new American Blower Capillary Air Washers. Remember, BAD AIR IS BAD BUSINESS!

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*Division of American Radiator and Standard Sanitary Corp.*

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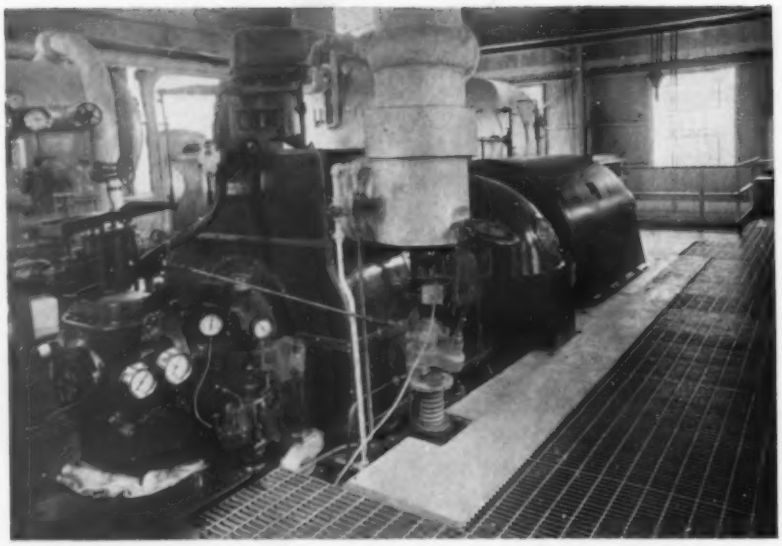
FANS • BLOWERS • AIR WASHERS



Turbine-generator set of 3000 kw. capacity driven by steam at 400 p.s.i. pressure at 3600 r.p.m. to develop plant power requirements

cess power is used by the local power company. An average of 11 lb. of steam at the turbine is required to develop one kilowatt of power, and 70 to 80 percent of the steam is utilized for power.

The balance is by-passed the turbine into the condenser for recovery of the heat contained, in the form of hot water. Average coal consumption in the plant is 2300 lb. per kiln hour with about 130,000 lb. of air per hour, for four kilns, passing through the waste heat plant. Draft at the back ends of the kilns is held to 0.12 in. of water. Actually, the power requirement to make cement has increased from 17 kw. per bbl. to 20 kw., resulting from electrification in the quarry, waste heat plant, and the installation of additional electrically-powered equipment. Pyrometers are used to record and control the waste heat gases into and through the boilers, and the temperatures at the economizers, and the two 147-in. diameter induced draft fans.

By the installation of modern equipment throughout and dust collectors at the stacks, the raw mix required to make a barrel of cement has been reduced from 650 lb. to 580 lb. Each waste heat boiler exhausts through a battery of six small cyclone collectors, operating under suction, which have an estimated recovery efficiency of 85 or 86 percent. These cyclones are automatic in operation and discharge through hoppers into an enclosed screw conveyor. Dust from collectors, flue boxes, economizers and other sources are conveyed by screw conveyors and elevated into a bin near the blending tanks. From this bin, the dust is blended into the fresh raw material kiln feed as it is withdrawn from the blending bins to the pump, using an inclined screw conveyor to feed the dust into the stream at the pump.

### Finish Grinding in Two Stages

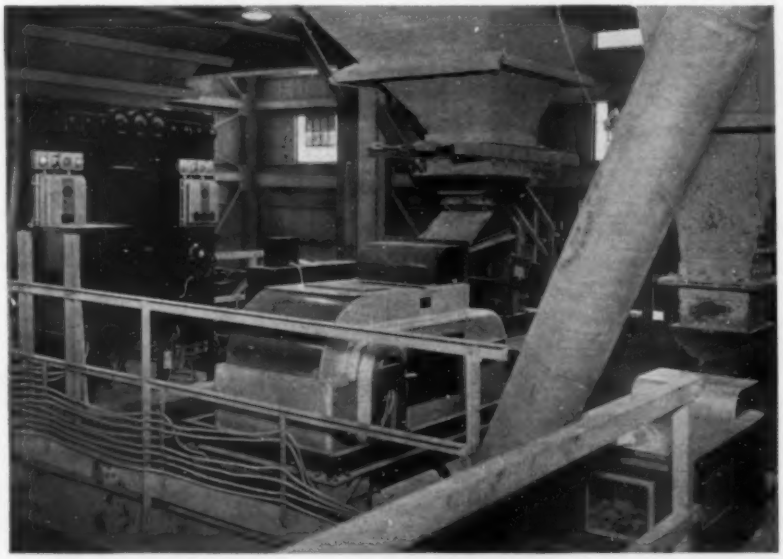
Clinker storage capacity is 25,000 to 30,000 bbl. under covered storage, from which the clinker is drawn by belt conveyors to be placed in bins for feeding the grinding mills. Clinker temperatures are slightly above atmospheric temperatures at the time of grinding.

Finish grinding is in two stages—with the preliminary grind through a single Hercules mill driven by a 350-hp. direct-connected electric motor, in open circuit, followed by closed-circuited grinding in tube mills. Clinker, from a 1050-bbl. steel bin, and gypsum, from an 86-ton bin, are proportioned to the preliminary mill over two constant weight vibrating feeders of the same kind as used in grinding raw materials. The mill has automatic overload electric controls to stop the feed into it.

With two 6- x 22-ft. tube mills closed-circuited with two 14-ft. mechanical air separators, the preliminary mill was operated 20 to 22 hr. a day to keep the finish mills operating 24 hr. Using a 10- to 12- or a 14-mesh discharge screen, the mill was producing 125 to 150 bbl. per hour of a product roughly 50 percent minus 200-mesh, depending upon the character of the clinker. A 9-mesh discharge screen and a fineness of about 30 percent minus 200-mesh were to be adopted with the installation of a third finish mill. Material ground through the preliminary mill is elevated into a 330-bbl. tube mill feed bin.

Each tube mill (two in operation) is driven at 28 r.p.m. by a 300-hp. electric motor and its discharge is put through a 14-ft. air separator, with a circulating load of about 175 percent. Screw conveyors from the tube mill feed bin convey feed material into each tube mill, with a reject screw conveyor installed under the other conveyors so that rejects are preferentially returned into the mills before fresh feed is fed in. The reject conveyors have variable speed drives.

Finenesses in the old plant were limited to a surface area of about



Finish grinding electro-magnetic feeders. The one on the right is for gypsum, and the left one is for clinker. They proportion for preliminary mill feed

# THREE OUTSTANDING DEVELOPMENTS:

**The Vanderwerp Recuperator for Rotary Kilns**

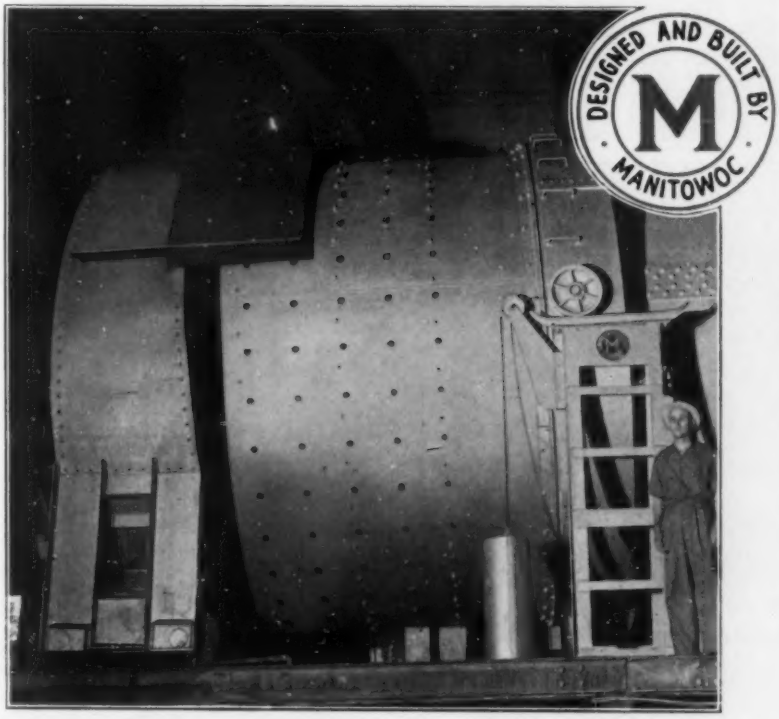
Insures immediate air quenching and maximum heat recovery.

**The Minogue Slurry Agitator**

Provides thorough agitation and blending with minimum power and air consumption.

**The Minogue Kiln Feeder**

The only practical device for introducing flue dust in the dry state.




Vanderwerp Type S Recuperator applied to Unit-Fired Rotary Cement Kiln 11 ft. x 400 ft.

The demand for Recuperators of high capacity has resulted in our Type S design suited to kilns of maximum output. In all cases the Recuperator may be readily attached to an existing kiln, requiring the minimum of labor in erection, involving no foundations or brickwork and occupying minimum floor space.

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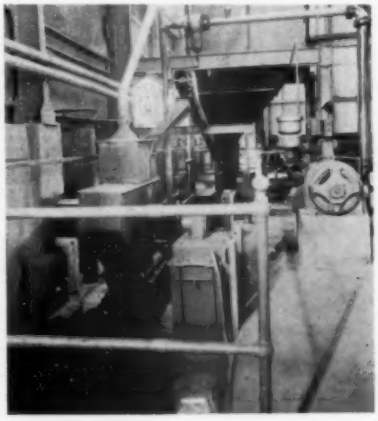
1650 sq. cm. per gram, but the new plant grinds to 1700. Each mill carries a load of 50,000 lb. of ¾-in. forged steel balls and is water-sprayed to produce a finished cement with a temperature of 190 deg. F. Finished cement is pumped into storage by a 6-in. type H Fuller-Kinyon cement pump. This pump, and the two other bulk material pumps, each have individual rotary air compressors for their operation.

A bag-type dust collector in the clinker tower collects and returns dust on to the belt conveyor carrying clinker to the finish mill feed tanks. Another bag-type collector, in the finish mill, relieves pressures in conveyor boxes and chutes and collects the dust from every source. This dust is returned into the screw conveyor carrying material into the air separators. Finished cement is sampled at the cement pump.

Storage capacity for finished cement is about 161,000 bbl., consisting of six new concrete silos of 10,000 bbl. each, interstice bins, and thirty-two 3000-bbl. bins in the old shed-type stock house. Two packing machines are in operation, but nearly 50 percent of the production is shipped in bulk.

The Union Bridge plant was operated as the Tidewater Portland Cement Co., until 1925 when Lehigh



**Bulk material pump is shown to the left in pit. Bin from which inclined screw conveyor is fed dust, shown in the center**

purchased the plant. Construction of the new plant was begun in 1938 and production resumed in June, 1939.

Union Bridge successfully hurdled the construction period without a single lost time accident and has now enjoyed a no-accident record without interruption since July 13, 1936. Safe operation practices such as adequate railings, fool-proof stairways, enclosed drives and alarm signals when equipment is to be started up have been incorporated throughout. G. S. La Forge is superintendent of the plant.

## Tennessee Phosphate Field Activities

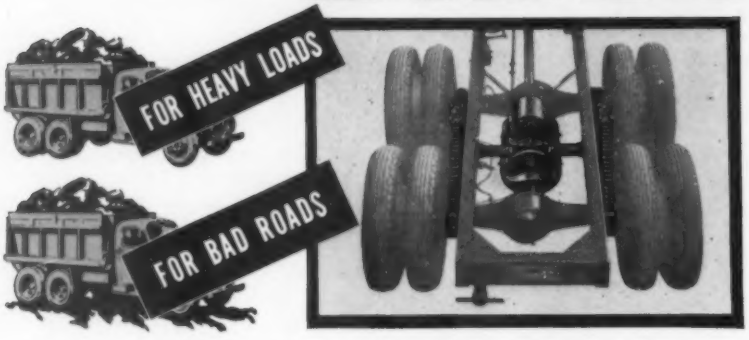
THE CHARLESTON MINING CO., Mt. Pleasant, Tenn., had the misfortune to have the high earth embankment holding one of their largest settling ponds undermined by crawfish holes, and the entire pond precipitated into Sugar Creek, with its contents of mixed mud and phosphate fines. Loss of water for operations is particularly unfortunate at this time. Excavating and handling equipment was buried by the flood.

INTERNATIONAL AGRICULTURAL CORPORATION mining activities at Southport were interrupted by a strike of the truckers hauling from the mines to the plant.

THE HOOVER & MASON construction work at their plant is proceeding rapidly as it is planned to have the plant in operation early in August to meet the big Fall demand. TVA operations on Bear Creek and at Godwin are being pushed.


THORNTON

4-REAR-WHEEL DRIVE




In these days when *transportation* must sustain the heavy demands of defense and industrial programs, THORNTON Four-Rear-Wheel DRIVE is rendering a tremendous service in scores of industries. With its application to trucks up to 3-ton rating, it supplies double the tractive effort and more than twice the payload capacity.

***This unit is giving vital aid in solving defense transportation problems.***

Engineered particularly to meet YOUR requirements, your THORNTON-equipped trucks will carry their bigger loads faster, more economically and, if necessary, through tougher going. "Walking-Beam" dual suspension reduces shock on load and road.

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Manufacturers also of the THORNTON automatic-locking DIFFERENTIAL
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Making 11,000 barrels of cement a day without dust or fume loss establishes a new performance record for Cottrell Electrical Precipitators at Permanente.
Dust collected in the hoppers of the Precipitator is carried by screw conveyors to the kiln feed house to be returned to the kiln feed or to storage.
Where the high overall efficiencies on dust and fume possible with Cottrell Electrical Precipitators are not necessarily required, Western Precipitation Corporation offers a range of Multiclone equipment which, in combination with Impax Separators, will provide for the classification of the recovered dust and give any desired recovery except for the very fine dust and fume.
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ROCK PRODUCTS

## . . . WITH AN ORDER FOR A NEW COTTRELL TO TAKE CARE OF A 33⅓% INCREASE IN KILN CAPACITY

The above advertisement appeared in the February, 1941, issue of ROCK PRODUCTS. Since that time Permanente has added a new kiln, raising production 33⅓ per cent, and a new Western Precipitation Cottrell to take care of this increase. ¶ In 1940 over 40 per cent of all orders received by Western Precipitation Corporation were repeat business. No greater vote of confidence could be expressed by the owners of Western Precipitation Cottrell Electrical Precipitators.

# Ball Coating in Grinding

**Tests show ball coating in grinding is a mechanical process; use of dispersing reagents, closed circuit operation, and harder grinding media recommended**

By FRED C. BOND* and FRED T. AGTHE*

IT HAS BEEN OBSERVED for many years that when materials are ground dry in a ball or tube mill, a stage is often reached at which the balls or pebbles become coated with the material. The coating usually begins to collect on the mill lining at the same time that coating appears on the grinding media. When this occurs, the customary noise of grinding gradually changes to a dull muffled sound, and finally the size reduction of the particles practically ceases.

The amount of this injurious coating varies widely with different materials. A certain limestone may coat so badly that grinding virtually stops at a fineness of 90 percent through 200-mesh, although a limestone of a different texture may be ground to 97 percent passing a 200-mesh before the grinding ceases. Different cement clinkers behave in much the same manner, while more highly siliceous materials, particularly quartz, can be ground usually to a much higher degree of fineness. A laboratory test must often be made before the grinding behavior of specific materials can be predicted with any degree of accuracy.

Little has been published regarding this subject, although in recent years greater fineness requirements have directed the attention of mill operators to the importance of the problem and the necessity for its practical solution. Much of the data which have thus far been made available have not been correlated in line with an attempt to determine the basic cause, or causes, of the phenomenon. It is believed, therefore, that the subject is one of importance and it will invite further consideration as higher degrees of controlled fineness are demanded.

### Coating Tendency of Different Materials

With this background, an attempt has been made to collect and correlate the limited amount of information available. Much of it was derived from grinding tests made in the Allis-Chalmers laboratories.†

It has been found that in general soft materials tend to coat at coarser sizes than hard or brittle substances. Limestone coats more readily than quartz even though limestones of different texture and composition show wide differences in the degree of coating.

Quartz usually passes 325-mesh before coating becomes serious. However, rocks containing minerals other than silica tend to coat more readily than pure quartz. Granite, composed essentially of feldspar, quartz, and mica, has been found to begin coating at about 92 percent passing 200-mesh, and feldspathic minerals alone usually tend to coat at the same fineness.

Apatite and phosphate rock tend to coat. Gypsum and bauxite coat readily. Hematite usually coats, although when mixed with charcoal it does not. Commercial glass, slate, talc, coal, and coke have little tendency to coat.

### Grinding Media

The character of the surfaces of the grinding media used does not affect the coating as much as might be expected. No difference in coating is discernible between cast and forged balls, when grinding the same material. Hardened ball bearings will coat as soon as the surfaces have been roughened by grinding. However, in grinding with a mixture of hard and soft balls, the softer balls will coat first, probably because their abraded surfaces are more uneven. Large and small balls in a mixed charge coat to about the same extent. Silica pebbles when used as grinding media coat to about the same extent as iron balls, and a porcelain mill lining coats similarly to a cast iron lining.

The materials that resist coating appear to fall into two general classifications; one includes such exceptionally brittle substances as quartz and glass; the other includes materials that appear to have some lubricating or smoothing action on the grinding surfaces, among which are coke and resin.

The presence of moisture is not required for the formation of coating, but a few tenths of one percent of water usually produces incipient coating. Cement clinker shows an important exception to this rule, probably because the small amount of moisture selectively hydrates the finest particles present, which are the most effective in the formation of coating.

The temperature of the mill charge is generally believed to be most important, although laboratory evidence is somewhat contradictory on this point, because it is known that many materials will coat both cold and at temperatures above the boiling point of water.

The presence of a considerable amount of relatively coarse particles in the mill charge reduces coating, which becomes detrimental only after these particles have been reduced in size.

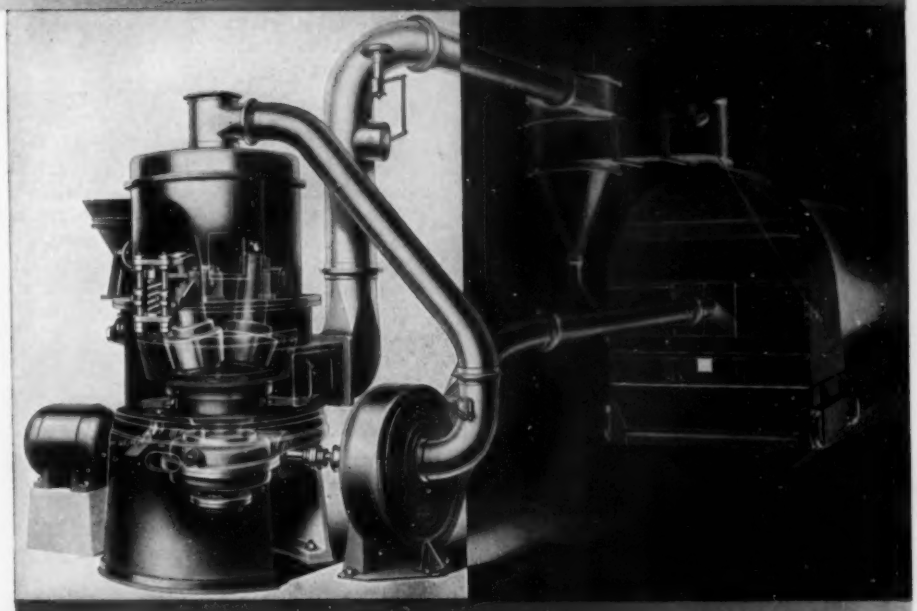
Ball coating constitutes a serious deterrent to the fine grinding of cement clinker, and becomes increasingly so, in many cases, as the desired fineness is increased. Different clinkers may vary widely in their tendency to coat, but the reasons for the differences are not well understood. Rapid cooling or quenching of the clinker immediately after leaving the kiln appears to decrease coating.

One of the hypothetical causes of ball coating is static electricity. Electrical charges are produced on the particles by friction within the mill. Particles of charges of opposite signs tend to adhere to each other. They might also tend to adhere to metal ball and liner surfaces which carry a charge opposite in sign to their own. One important apparent fallacy of this hypothesis is that charges of the same sign are normally produced on similar contacting particles by friction. Instances have been observed where the resulting material repulsion has caused a "fluffing up," and

*Allis-Chalmers Manufacturing Co., engineering department.

†Ref. F. C. Bond and F. T. Agthe, "Deleterious Coatings of the Media in Dry Ball Milling," A.I.M.E., Tech. Pub. No. 1160, March, 1940.

# The BOWL MILL



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. . . a self-liquidating investment. In many cases, it has paid out its cost in less than 18 months of operation . . . through extra economies in kiln firing.

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Complete operating panel board includes all controls for pressure, draft and rate of feed. Provides graphic record of the bowl Mill performance.

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**It is the modern Direct Firing Unit with an all-time low in coal preparation costs. Ask for Catalog No. 43.**

- **Handles any grade of coal**
- **Noiseless, dustless operation**
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- **Record low maintenance**

**RAYMOND PULVERIZER DIVISION**
COMBUSTION ENGINEERING COMPANY, INC.
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loss of specific weight of the ground material. In contradiction to the major premise of this hypothesis, it would follow that static charges induced on the metal grinding balls, which are opposite in sign to those on the particles, should be conducted immediately to the metal lining and dissipated to the ground.

Another explanation involves changes in the surface character of the particles by the adsorption of dissimilar substances. This is undoubtedly important, particularly where reagents to prevent coating are used, although the mechanism of the process is difficult to understand. A film of adsorbed air may surround the finely ground particles, which would tend to prevent their coalescence. Where dispersing reagents are used to reduce coating, the adsorbed reagent may strengthen this air film. A third explanation is that the formation of the coating is mechanical, and results from particles tamped and rammed together by impact upon the roughened ball surfaces. The authors believe that of the three probable causes thus far explored, this has the greatest direct effect, and is, therefore, the most important.

**Fundamental Causes of Coating**

Some laboratory tests were made with the purpose of studying the fundamental causes of ball coating. These included a series of microscopic observations and determinations of specific surface with a Wagner turbidimeter.

Under a high magnification the surfaces of used grinding balls are seen to be completely covered with intermingled pits and scratches. These average from one to three microns in diameter, or 0.00004 to 0.00012-in., and perhaps two-thirds of this in depth. The balls feel rough to the touch because of these intermingled pits and scratches.

A sample of cement clinker which showed an exceptional tendency to coat was ground to 85.1 percent passing 200-mesh or 74 microns, with ⅞ in. forged steel balls; the balls were completely coated to a thickness of 1/16 in. or more. The outer part of the coating was relatively loose, and particles could be rubbed off readily between the fingers. Microscopic examination showed that only a few of the largest of these particles were over 15 microns in diameter, and none was over 20. Most of them were less than 10 microns.

The particles composing the more firmly adhering undercoating were smaller and were all under 10 microns.

The strongly resistant coating next to the ball surface had to be removed by brushing in gasoline. These particles were extremely fine, and most of them were 3 microns in diameter or less. None was seen larger than 5 microns. They had been packed so tightly into the ball scratches, that the microscope showed practically no void space between them.

The general structure of the coating showed that extremely small particles had been wedged into the scratches and pits on the ball surfaces, and that slightly larger particles had been tamped into place among the small ones. As the depth of the coating increasd, the maximum size of particles increased slightly, but the coating always consisted of only the finest particles in the charge. Wagner turbidimeter determinations showed that the specific surface area of the coating was more than twice as great as that of the average mill product. The extremely fine particles in the charge are evidently responsible for the coating.

Chemical analyses have indicated that gypsum added to the clinker before grinding tends to concentrate in the coating; and in a test conducted without gypsum more size reduction was accomplished and less coating was formed. The gypsum is soft and quickly furnishes a supply of the extremely fine particles necessary to start the coating process.

This was confirmed by another test in which the three percent of gypsum was replaced with precipitated zinc oxide, an extremely fine and soft powder. Less grinding of the clinker was accomplished and the balls were more badly coated than when gypsum was added.

A test in which 0.88 percent water was added showed more grinding and less coating than had been obtained heretofore, presumably because the fine particles necessary for coating had been hydrolyzed. However, a test in which a 15 percent solution of a patented lignin compound was used instead of water gave the best results of all.

The test results indicate quite strongly that coating is a mechanical process, starting with particles smaller than from 3 to 5 microns in diameter, which are tamped into the pits and scratches of the ball surfaces by the impacting balls. If this is true, the proper remedy is to either reduce the amount of the fine particles present, or to prevent their retention in the ball scratches.

Reagents which are successful in preventing coating must have some similar quality. If these reagents are adsorbed upon the fine particles or upon the ball surfaces, and permit the particle which has been driven into a ball scratch by impact to slide free, the desired result has been obtained.

A number of reagents have been tested, including several liquid wetting or dispersing agents, with varying results. It was found that a certain reagent may be quite effective in preventing coating when used in grinding a certain material, but the same reagent may be impotent or even detrimental when used in grinding other materials. Apparently, a particular reagent should be recommended for use only when grinding certain specified materials. This indicates that considerable research may be involved in the solution of a specific coating problem.

Certain mechanical features of the grinding operation may be utilized to reduce coating. One of the most important of these is the substitution of closed circuit grinding in place of open circuit. Tests made in the West Allis laboratories indicate that a reduction in coating, with attendant improvement in grinding, should result from mill operation, which includes an air separator in closed circuit.

Closed circuit operation normally reduces the amount of extremely fine particles produced by the mill unit, and, therefore, reduces the tendency to coat. This may be explained by the fact that a reduction in the amount of extremely fine particles present makes available fewer suitable particles for entry into the small pits and scratches on the surfaces of the grinding bodies, with a corresponding reduction in the tendency toward incipient coating.

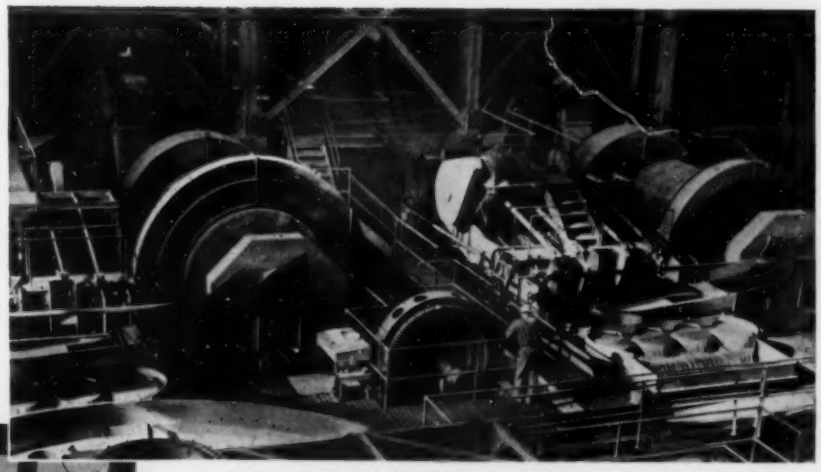
It has been observed that a circulation of some very coarse particles, plus 35-mesh, through the closed circuit grinding unit shows a tendency to wipe off the coating.

Finally, the use of harder surface grinding bodies to reduce the formation of the microscopic pits and scratches should be beneficial in reducing coating.

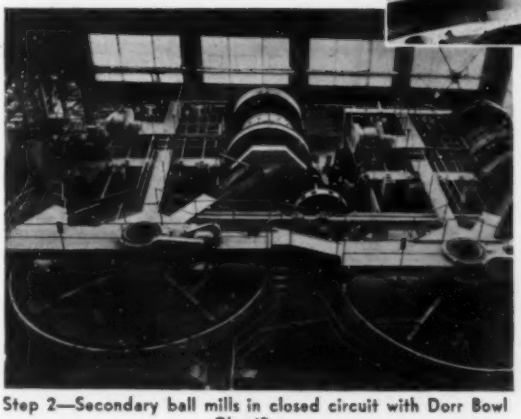
## Concrete Records at Shasta

A NEW ONE-DAY RECORD for placing concrete on the Central Valley Project in California was set at Shasta dam on June 22 when 8267 cu.yd. were poured. Pouring operations at Shasta are about 30 percent completed. Friant dam on the San Joaquin river near Fresno now has 60 percent of its volume of 2,200,000 cu.yd. of concrete in place, with a record day's pour of 7634 cu.yd.

# BETTER CEMENT RAW GRINDING

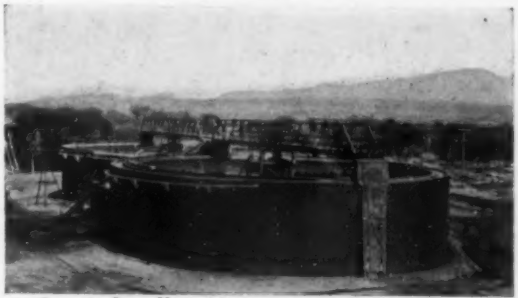


Step 1—Primary ball mills in closed circuit with Dorr Classifiers.



Step 2—Secondary ball mills in closed circuit with Dorr Bowl Classifiers.

Step 3—Dorr Thickener concentrating bowl classifier overflow to slurry density.



Step 4—Dorr Slurry Mixers correcting thickened slurry.

## THROUGH DORR C. C. G.

The Dorr C.C.G. (Closed Circuit Grinding) System, grinding to 90-98 percent minus 200 mesh, requires only 3-4 K.W.H. per barrel of raw wet grinding—1/2 to 2/3 the average for the cement industry.

It pays for itself through power and other savings. It helps to produce a stronger and sounder finished cement through uniformly fine grinding and the elimination of coarse, tramp oversize in the kiln feed.

Practically every new wet process plant built in this country since 1935 has installed Dorr C.C.G. for capacities ranging from 2,500-12,000 barrels per day. It may be installed, too, in existing mills seeking greater economy and quality.

### ADVANTAGES

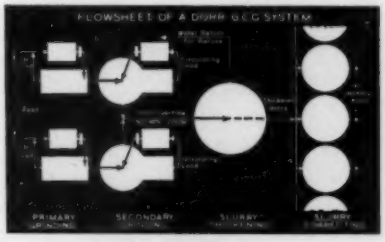
**Less Grinding Power**—35 to 50% less.

**More Ball Mill Capacity**—100 to 125% more.

**No Tramp Oversize**—less than ¼ of 1 percent plus 100 M when overflowing 96 percent minus 200 mesh.

**More Uniform Kiln Feed**—less than 6/10 of 1 percent $CaCO_3$ variation.

If you are about to build, re-equip or shift from dry to wet processing, write for 16-page technical reprint on Dorr C.C.G., complete with flowsheets, operating data, cost analyses, etc.




9 Dorr C.C.G.-equipped mills have an aggregate capacity of 43,650 barrels per day.

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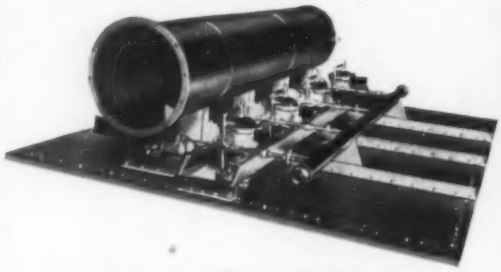
# "NORBLO Collects our Dust"

**— Santa Cruz Cement Co.**



# 19 of these NORBLO

**Automatic Bag Type Dust Arresters**

**have been installed since November, 1939, in the plant of the Santa Cruz Cement Company of Davenport, California. And two more NORBLO installations are now under way!**

**This plant is well known on the West Coast, having been an important factor in local cement production since 1906. A large-scale modernization plan to "step up" plant efficiency is nearing completion.**

**All the new units of the dust-collector equipment were furnished by NORBLO. The Santa Cruz management states:**

> **"They have been most satisfactory, since they are the only collectors we have used that will handle dust-laden air of high moisture without plugging the cloths."**

**The NORBLO Automatic Bag Type Dust Arrester provides positive, progressive cleaning which functions with practically no drop in static pressure throughout the operating cycle. The NORBLO is simply designed, and sturdily built to operate continuously under heavy loads for long periods. The complete shaking unit is mounted on an extra heavy top plate. Working parts are in the clear for easy inspection.**

**NORBLO Arresters work at peak efficiency, since the dust accumulation in the bags is held to a minimum. Compartments may be inspected safely at any time. One unit can be withdrawn from the line, and repairs made, without "holding up" operations.**

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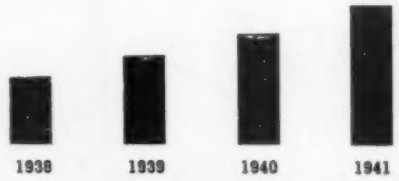
# BIGGER and BETTER

## *Cement Numbers*




A year ago we had to admit "Our Plans for this August Cement Issue, we know now, were too ambitious. We have an apology to make for leaving out some of the subjects promised." Even so, the 1940 Cement Number had no previous equal. Now we present the 1941 Cement Number—Bigger and Better than last year's.

As with last year, our plans have again been too ambitious. The special cement section wasn't big enough for all the articles. So, rather than leave them out, four of the major articles that are part of this year's Cement Number have been placed elsewhere. They are:

**From One to Five Types of Portland Cement**

**Effect of Dispersion of Cement Raw Materials**

**Depreciation in Cement Plants**

**Facts About Portland Cement Statistics and Prices of Varieties.**

These and the articles in this "cement section" make up ROCK PRODUCTS 1941 Cement Number. We don't have to point out that every one of the EIGHT major articles is a real contribution toward better manufacturing practice—and better cement.

Again ROCK PRODUCTS has proved itself worthy of its editorial supremacy. In addition to a cement section devoted *exclusively* to cement manufacture, the August Issue again contains informative articles on *every* major branch of the rock products industry. The August Issue again attests the keystone that has made ROCK PRODUCTS "the industry's recognized authority"—to keep *you* informed on the manufacturing trends that will be standard practice tomorrow; on what market conditions will require changes in manufacturing methods; and informed on what is happening in the industry.

Whether you make cement or whether you make machinery to be used in cement manufacture, ROCK PRODUCTS offers you the best investment for the money.

**ROCK PRODUCTS**

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Chicago, Illinois

# MORE AND MORE CEMENT MILLS ARE ADOPTING FINER CRUSHING ON BOTH RAW AND CLINKER SIDES

Since it is more economical to crush down to 3/8 inch and even finer, than it is to grind a coarse mill feed, many cement mills in this country and overseas have found that when raw material and clinker are crushed in Symons Cone Crushers overall production costs are materially reduced. In addition to reducing costs, a finer mill feed increases mill capacity with the same power input. It is also possible to use smaller balls with more points of contact and more ball area available for grinding. Liner wear and grinding mill maintenance are also lessened. These and other advantages can be achieved through finer crushing with Symons Cones in the production of cement.

WRITE FOR THIS BOOKLET GIVING FURTHER PARTICULARS ON SYMONS CONE CRUSHERS AS APPLIED TO CEMENT MILL SERVICE

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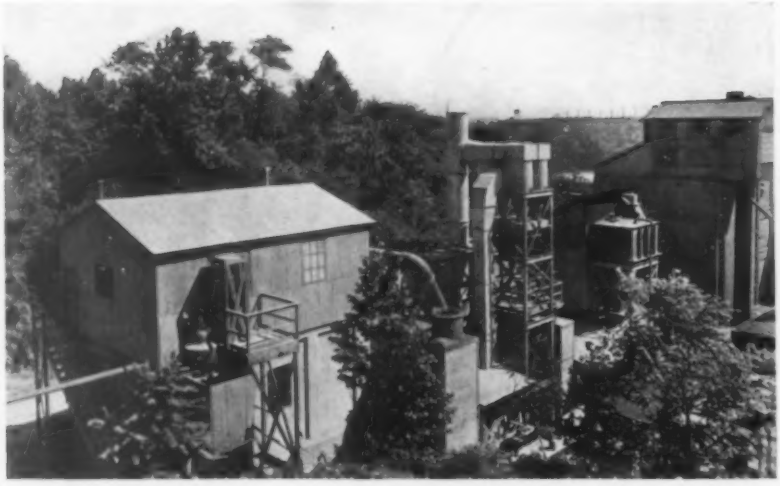
# SYMONS CONE CRUSHERS



**At Valley Forge plant, the rejects are pumped from the 80-ft thickener through the pipe line at the left to a filter, the filter cake being delivered on a belt conveyor to an inclined grate dryer, fired by pulverized coal**

## Flotation

*(Continued from page 42)*

ent No. 2,144,254, the flow sheet illustrating the processing being shown in Fig. 8, except that at the National plant the centrifuge replaces the bowl classifier, and omits the preliminary grinding circuit, taking the slurry from the tanks following the tube mills (Fig. 7), which are operated in open circuit. The concentrates from the Fagergren cells, being a finished product, join the centrifuge cake in the thickener. For the manufacture of its regular commercial cement from its average rock, about one-half of the mill stream tonnage is sent directly to blending tanks, the other half being fed to the centrifuge which makes the split at about 15 microns, the cake and effluent being of about equal weight. The cake has an increased $CaCO_3$ content of about 3 percent and is a finished product. The effluent, representing 25 percent of the total tonnage is concentrated by flotation, remixture of these concentrates with the cake and untreated half of the mill stream resulting in kiln feed composition. A comparison of Figs. 7 and 8 show how, in this particular case, the centrifuge has simplified the flow sheet.

The chief feature of the processing at the National plant is the successful concentration of useful products from an impure limestone, practically unaltered by metamorphosis (recrystallization), in which the minerals are extremely fine grained. The process adopted permits concentration without the extremely fine grinding that would be required to break it down to this elementary grain size, by utilizing *subtractive* flotation of the undesired minerals. This process, of course, is the reverse of that employed in the original Valley Forge flow sheet, and those of the Parana and Permanente plants.

The three most recent Breerwood patents, Nos. 2,214,716 and 2,214,715 and 2,214,717, issued September 10, 1940, and applied for in June, 1939, cover the use of centrifuges in the flow sheet in various ways, to make a definite composition correction or change, and also both in combination with hydraulic classifiers and as substitutes for hydraulic classifiers, to make the split at a lower point in the particle size range, as at the National plant. They also cover the use of a centrifuge alone, without flotation cells, in which process the effluent is waste and the cake is kiln feed. Used in this manner the centrifuge may also serve to dewater the slurry.

Patent No. 2,214,715 describes the reduction of the alumina content of appropriate types of both argillaceous limestones and clays or shales by separating the very low orders of particle size from the coarser mineral particles, separations being made as low as 2 or 3 microns. In making the separation at such a low point in the particle size range, the operation of the centrifuge is described as equivalent to using it as a slightly overloaded dewatering device. In the Lehigh Valley limestones, for example, the clay minerals are naturally of extreme fineness and are readily released from the calcite and quartz by closed circuit grinding without excessive reduction of either of the latter. The concentration of the aluminum and magnesian silicates in the lowest orders of particle size makes it possible to produce a centrifuge cake of satisfactory composition for the manufacture of modern cements from some natural rock, with little or no subsequent additions, and sometimes with weight losses in the effluent of less than 10 percent of the total rock. This process has been found satisfactory for the treatment of clays and shales in which the aluminum silicates are naturally fine, for the purpose of increasing the silica ratio.

### Use of Centrifuge

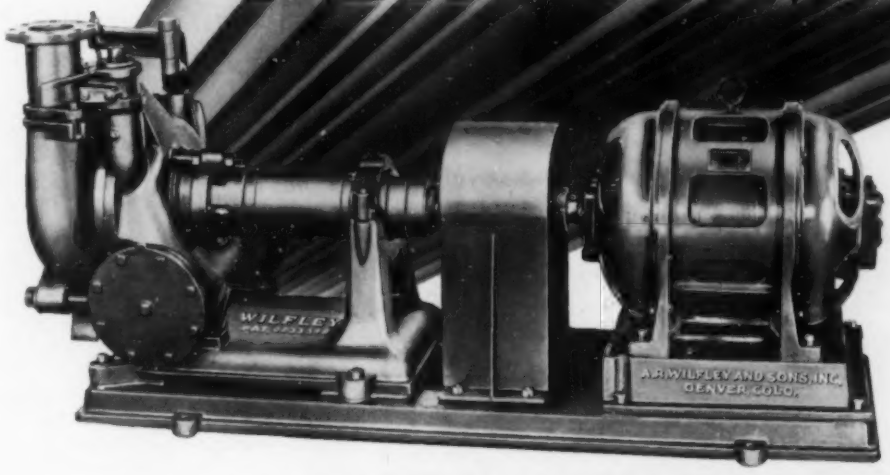
In the principal circuits described, the centrifuge either provides a cake of improved amenability to froth flotation, because of the removal of colloidal particles, and usually of improved calcite content following the removal of fine silicates, or a preliminary cake of improved calcite content and silica ratio requiring no further processing other than blending with concentrates of flotation derived from the effluent. A further process is described in which the effluent of the first centrifuge is separated in another for the purposes of removing the colloidal matter, including aluminum silicates, and to provide a secondary cake especially satisfactory for efficient flotation concentration because colloidal matter is substantially absent and the mineral grains are separated. This flow sheet obviously reduces to a minimum the proportion of the weight of the mill stream requiring the more radical minerals separation obtainable by flotation.

Breerwood's objection to coarse particles and especially coarse quartz in the kiln feed has been mentioned. It is evidently his opinion that extreme fineness, or at least a large proportion of low orders of micron sizes with a wide range in particle size is undesirable in kiln feed. In this, he went beyond the present proponents of closed circuit grinding. With respect to the low orders of particle size; e.g., the particles minus about 2 microns and mica particles minus 5 or 6 microns, and their elimination by the use of a centrifuge, in each of the patents of this group, he said, "I believe that these low orders of particle size, and especially the silicates, are eutectic and are 'overburned' at the temperatures required to combine the coarser constituents. As the proportion of silicates, when present, is usually relatively great in the minus 2 micron fraction, and because nascent silica is extremely active, this fraction should be eliminated from the final mixture, together with the larger ranges in particle sizes of micaceous matter, if present. Even if these low orders of size are largely calcite, it is preferable to eliminate them for these reasons from the ultimate mixture, rather than to re-com-

*(Continued on page 66)*

*Cost Saving*

# PERFORMANCE

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# WILFLEY

## centrifugal SAND PUMPS

bine the separated fractions with the recovered product or products."

The latest patent, by Vogel-Jorgensen, No. 2,216,992, issued October 8, 1940, covers various reagents made from the waste products in refining cocoanut oil or soy bean oil, or similar animal or vegetable oils or fats. It is claimed such a reagent is particularly effective for concentrating, or floating, calcite in a cold water medium, as is the usual case.

### Valley Forge Flow Sheet

The present flow sheet (Fig. 9) of the Valley Forge Plant is a combination of the processes described, in which some of the flotation cells recover the calcite as a flotation concentrate and some of the cells recover the quartz, oxide iron, and unbroken particles of calcite and quartz as tailings, in accordance with the flow sheet of patent No. 2,161,011. The processing here could be accomplished simply by the flotation concentration of the two micas, as described in patent No. 2,161,010, preferably supplemented by a preliminary centrifuge separation, as in patent No. 2,214,716, which describes this combined flow sheet, but the present arrangement is somewhat more economical in reagent costs. This is so because the actual purpose at Valley Forge is to eliminate excessive proportions of muscovite and phlogopite mica, as this increases the proportion of lime and free silica and reduces the alumina, magnesia and alkalis. (Fig. 10 shows the same flow sheet simplified and with the centrifuge in place of the classifier.)

### Summary

The purpose of the foregoing, obviously, is not to give facts and figures in connection with the performance of the various units, or the proportions of the raw materials which it is required to treat in each installation. There are locations, probably, where all the raw materials could be economically processed, but in none of the installations to date has this been necessary. The object of this article has been merely to trace the developments in the flotation process as applied to the processing of cement raw materials, with reference to the patents by number and date. This series of patents, incidentally comprises a veritable text-book on cement manufacture. There is, of course, much repetition, and like all patent specifications, these are hard reading, although Geo. K. Engelhart, the author of the specifications, has written them so clearly that the industrious reader can get a liberal education in cement manufacture from them.

## Nonmetallic Minerals Used In Chemicals

A NOVEL method has been used by R. N. Keller and T. T. Quirke of the University of Illinois to trace the geologic origin of the constituents of important industrial chemicals. The results of their studies are contained in a paper entitled, "Mineral Resources of the Chemical Industries."

First in the tabulation of raw materials for all of the 150 leading industrial chemicals investigated is water. It is used 99 times, next in order come air, coal, and sulphur; salt ranks fifth, being used 75 times, and limestone sixth, with 63 times to its credit. Other nonmetallic minerals and their numbers follow: Saltpeter 13, potash minerals 11, gypsum 10, sand 9, phosphate rock 6, and barium minerals and boron minerals each 2. The numbers indicate simply the number of times each particular raw material was employed in the actual manufacture, not in the purification or treatment of the chemicals. No clue is given as to tonnages as this would require a vast amount of research.

Results are the true judge of explosives. What happens during each individual blast builds up your cumulative opinion of WHAT explosive and HOW MUCH of it is BEST SUITED for your OWN purposes. That is why National Explosives are finding such wide acceptance. Experience has taught us the importance of your using the RIGHT amount of the RIGHT explosive in the RIGHT manner. All this is incorporated into the National Explosives that are recommended to you.

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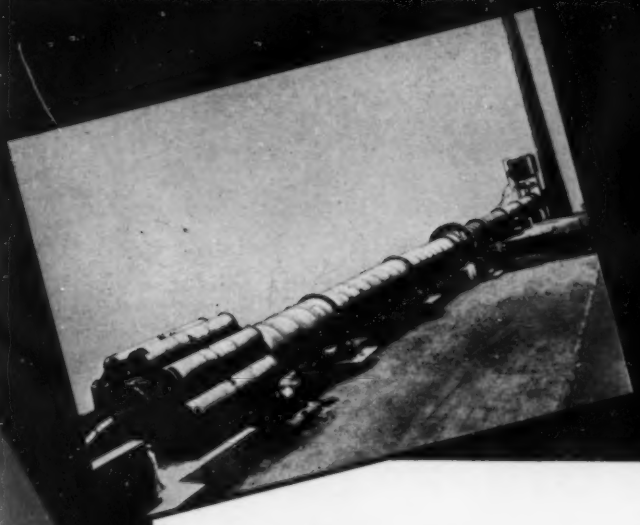

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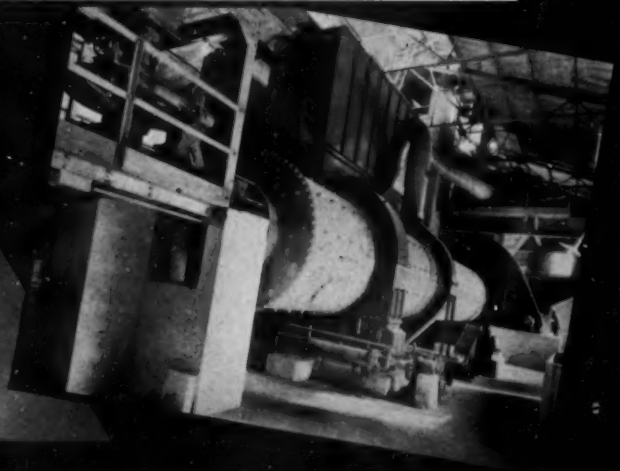

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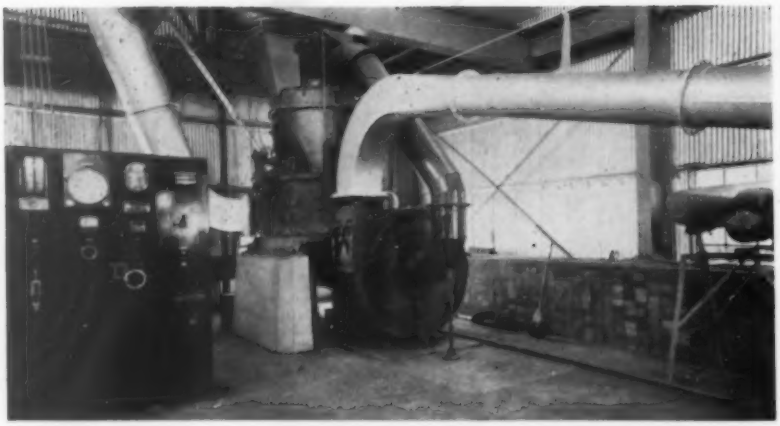

One of the direct-firing bowl mills which has helped to increase efficiency and improve working conditions

# Improve Firing Efficiency

**Volunteer Portland Cement Co., installs direct firing unit coal mills, and substitutes trucks for rail haulage from quarry to mill**

OPERATING EFFICIENCY has been stepped up at the Volunteer Portland Cement Co. plant, Knoxville, Tenn., by a series of mill improvements started in 1939. This program began with the installation of heat exchanger chains in the wet process kilns to conserve on coal consumption. In 1940, direct-firing unit coal pulverizers went into operation, improving kiln firing conditions and substantially reducing coal preparation costs. More recent changes include the substitution of truck haulage in the quarry for locomotives and cars, increased silo storage for finished cement and the adoption of two-stage, open-circuit grinding in the finish mill.

Volunteer has two 10- x 215-ft. wet process rotary kilns with a rated annual output of 1,125,000 bbl. of clinker. Each kiln has an individual 8- x 90-ft. rotary cooler, and until 1940, was fired with coal prepared in a centralized pulverizing plant. Moisture was then removed from the coal by passage through a revolving dryer, two mills ground the coal to an average fineness of 89.8 percent through 100-mesh and blowers injected the pulverized coal into the kilns from 50-ton bins on the firing floor.

### Direct Firing Unit Coal Mills

Firing efficiency, based on fuel-clinker ratio, was satisfactory, but other considerations called for the adoption of direct firing unit coal mills. It was desirable to eliminate a dusty condition and to have burning controls which would help to produce a better and more uniform clinker at a lower coal preparation cost.

Each kiln is now fired by a No. 452 Raymond bowl mill which is fed coal from the overhead bins that served the kilns in the old system. Coal of ¾-in. top size is delivered from coal storage into these bins by a Stephens-Adamson Redler conveyor.

Heated primary air for drying the coal while it is being ground is taken from the kiln hoods in each case and the secondary air, for combustion in the kilns, enters around the kiln hoods and from the rotary clinker coolers. Primary air as mixed with the coal is injected into the kilns at 300 deg. F., which is somewhat hotter than the practice of most cement plants using direct firing mills.

A fairly long flame burns the clinker, of about the same qualities as the flame produced by the old system of firing. However, coal is ground finer, to an average of 94.6 percent minus 100-mesh as compared to 89.8 percent passing 100-mesh before. These figures are taken from a year's record of operating data.

Left: One of the semi-trailer and tractor-truck haulage units dumping into primary crusher. Right: One of three haulage units which have replaced locomotives and trackage

# DUST CONTROL IS PROFIT CONTROL

## *Buell Equipment Saved One Company**

## $40,000 IN 13 MONTHS!

***DUST IS VALUABLE:*** Ore smelting, cement production, the processing of certain foods, and many other industrial operations create dusts that are commercially valuable. Their reclamation pays a direct and tangible profit in material saved. In addition, dust control pays indirect profits by *preventing* many losses from dust-caused contamination, reduced efficiency and lowered production rate.

The case cited above is just one example of savings made possible by Buell (van Tongeren) Dust Collectors. The high efficiency of the van Tongeren system of dust collection, offered only in Buell equipment, is evidenced by orders *and re-orders* from an impressive list of America's industrial leaders, firms such as—

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***and many others***

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**DUST COLLECTORS**

**Above, to the right, may be seen haulage unit dumping into primary crusher hopper, and on the left is the dust collector to catch all dust raised by primary crusher and hammer mill**

Coal finenesses are being held more constant, as well as the kiln burning temperatures, with subsequent more favorable clinker uniformity. Total coal consumed is approximately the same but there has been effected a saving in the ratio of 2:1 in the cost of coal preparation, using the same source of coal. In addition one of the worst sources of dust and dirt in a cement mill has been eliminated entirely. Estimates of the old coal preparation plant were that 24 lb. of coal were required, on an average per ton, to remove moisture in the rotary dryer and that three percent of this coal was lost due to dusting in the dryer itself.

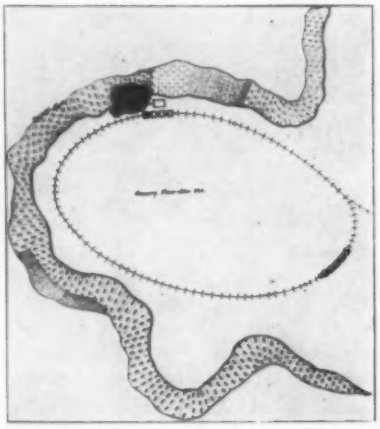
Since the installation of 36 ft. of F. L. Smidth chains in the back ends of both kilns, coal consumption has been lowered very materially.

### Quarry Haulage

In February of this year, trucks were placed into operation in the quarry, replacing locomotives and 8-cu. yd. cars on standard gauge tracks, to deliver limestone and shale to the crushing plant. Quarry conditions at the Volunteer plant present some unusual operating difficulties and trucks were selected as the best means of getting badly-needed flexibility.

The stone is a marble-limestone that occurs, not in a well-defined straight ledge, but as a highly-fissured, irregular mass of rock that is heavily eroded and full of crevices. Strata have tilts that dip in various directions and the good cement rock does not occur uniformly as it does in most quarries.

Stripping is done hydraulically as the only satisfactory means of contending with the crevices. The quarry is being worked roughly in an ellipse, 400 ft. wide and 800 to 900 ft. in length. It had been worked, using a circular track around the face. Track maintenance had been increasing as the excavation became larger and would continue to grow as more trackage would be needed, and, in this quarry, the old system did not



**Plan of quarry showing trackage displaced by trucks**

lend itself to the necessary selective quarrying method.

Trucks have made it possible to quickly re-locate the point of excavation to suit weather conditions, and have enabled "dodging" certain strata to get out the desired ledge rock for cement manufacture without much handling of the other stone.

Haulage equipment consists of two side-dump Easton semi-trailers on 95-hp. cab-over engine Ford chassis hauling limestone, and a third unit that handles the shale, on a part-time basis. These trucks haul 14 to 16 tons of limestone to the trip on a one-mile round trip, and 10-cu. yd. of shale on a shorter haul. A 2-way road is being completed out of the quarry.

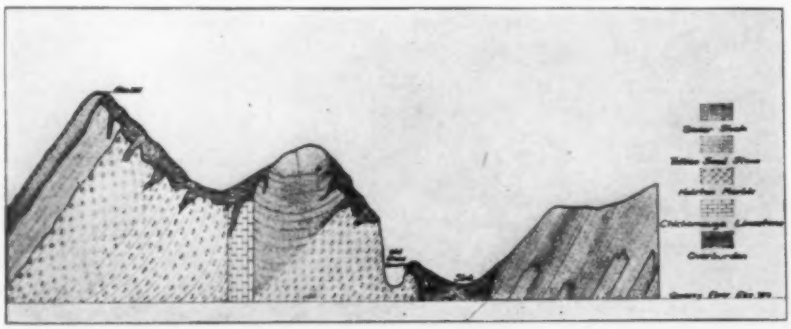
They have been in operation too short a time to compare haulage costs, including upkeep, with the old system, but there is evidence of a saving along with the flexibility which was the reason for which they were purchased.

In the preceding year, 1940, 26 days of quarry operation per month on a 9-hr. day were needed to keep both kilns supplied with stone. Since February of this year, twenty-one 10-hr. days per month have furnished the kiln requirements. Plant operation in 1940 and, in 1941 thus far, has been at full capacity. Gasoline consumption for the trucks is about 50 percent better with two trucks constantly busy on stone as compared with three with corresponding waiting time.

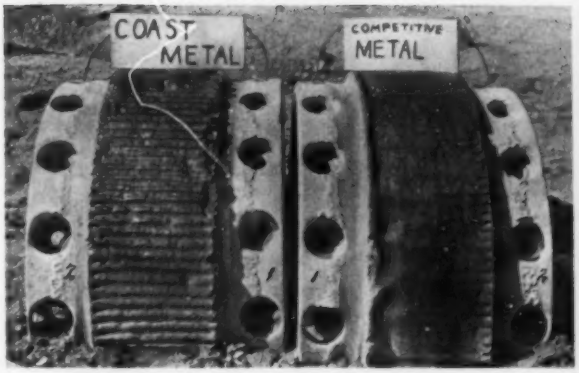
At the crushing plant, limestone is dumped into a 36-in. Allis-Chalmers gyratory crusher by an overhead Curtis pneumatc lift hoist. A belt conveyor carries the stone through this crusher to a Pennsylvania hammer mill which discharges on to another belt for delivery of stone into the grinding mill bins.

A Pangborn cloth-type dust collector has been installed between the two crushers, not to reclaim dust for re-use, but to improve working conditions around the crushers. Dust is drawn from the point of discharge from both crushers and other points of dust generation. Dust recovered is about two tons a day, which is not sufficient to reclaim into the slurry, but is hauled away and disposed of as such.

Clinker is ground into cement at this plant in open circuit with two



**Cross section of quarry showing up-ended strata with varying depth of overburden and different type of rock which lends itself to the more flexible truck haulage**

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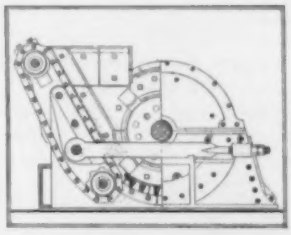

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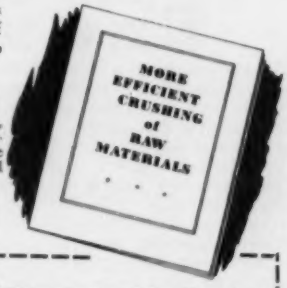


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7- x 39-ft. 3-compartment mills, and until recently, without a preliminary operation ahead of the mills. A combination of crushing clinker first through two 1-ft. 4-in. Traylor TY high-speed, gyratory crushers, and the use of mills rebuilt into a four compartment type has reduced overall power consumption while maintaining the same output, but with greater cement surface area.

Volunteer is now grinding standard portland cement to a surface area of 1750 sq. cm. per gram or to a fineness of 96 percent through 200-mesh at a better output at present fineness than some years earlier at 88 percent minus 200-mesh. Feed preparation through gyratory crushers ahead of the mills, has added a 30-hp. motor for each crusher, but reduced the power load for the mills more than that due to the reduction in the weight of grinding media and the advantage of feeding more uniform material into the mills.

Feed into the mills from bins has been reduced, through the use of crushers, from a top size as much as 1½ -or 2-in. which was variable. Seventy percent is minus ¼-in. and 100 percent through a ⅝-in. screen as the clinker is fed into the mills. Sizes of grinding media have been proportionately reduced. The first compartment where impact occurs is now loaded with 3- and 2½-in. forged steel balls where 3½- and 3-in. balls were used before. This is followed by 1¼- and 1¾-in. Concavex media in the second compartment and ⅞-in. Concavex in the third. Worn ⅞-in. media and ½-in. bolts make up the load in the finish compartment. Capacity for cement storage has been enlarged by 75,000 bbl. in 11 reinforced concrete silos; to a total of 170,000 bbl.

## Oldest Cement Company Celebrates 75th Birthday

THE COPLAY CEMENT MANUFACTURING CO., Coplay, Penn., will this year celebrate its 75th anniversary as the oldest cement plant in the United States. David O. Saylor, the founder of the company, whose name is incorporated in its brands, was the first to manufacture portland cement in the United States. In 1866, the Coplay Cement Company was incorporated with David O. Saylor as its president. In 1871, Mr. Saylor was granted a patent by the United States covering his process for making portland cement. At the Centennial Exposition held in Philadelphia in 1876, the company exhibited Saylor's portland cement in competition with well known European brands and was granted the award for superior quality. This company has been very aggressive in making plant improvements. In 1925, a comprehensive dry blending system was installed; in 1926, some of the first long compartment tube mills were placed in service for finish grinding; in 1932, the first Grudex preheating unit developed by the company was installed; in 1938, Diesel trucks and 2100 ft. of belt conveyors were substituted for railroad and hoisting equipment to convey stone from quarry to mill; in 1940, direct firing coal mills and a pneumatic conveying system were substituted for the old coal preparation department; and in 1941, two-stage close circuit grinding combined with drying took the place of separate drying and grinding machinery.

## Nine Year Safety Record Broken

MARQUETTE CEMENT MANUFACTURING CO., Cape Girardeau, Mo., had a nine year record of quarry operation without accident broken, according to an article appearing in the *Cape Girardeau Missourian* on June 25, when Louis Kraust, a rock crusher foreman, died from injuries sustained by a flying rock thrown during a blast. Manning P. Greer, safety engineer, was quoted in the newspaper as having said that there had never been such an unusual accident at the plant.

In an earlier blast of well drill holes, a half hole 15 ft. deep, had missfired. A subsequent shot is believed to have set off the dynamite in this hole away from the main blast, despite the fact there was no fuse or cap, throwing large pieces of rock over great distances.

Mr. Kraust was struck by one of the pieces and died when pneumonia developed as a result of injuries to his back.

## New York Crushed Stone Meeting at Elmira

NEW YORK STATE CRUSHED STONE ASSOCIATION held its monthly meeting at the Mark Twain Hotel, Elmira, N. Y., on July 24 with a luncheon which was followed by a general business session. Frank E. Redmond, director of the Inspection and Appeals Bureau of the Associated Industries of New York State, was the guest of honor. He was asked to give an analysis of the provision of Industrial Code No. 34 relating to the control of silica dust in stone crushing operations which will become effective July 1, 1942.


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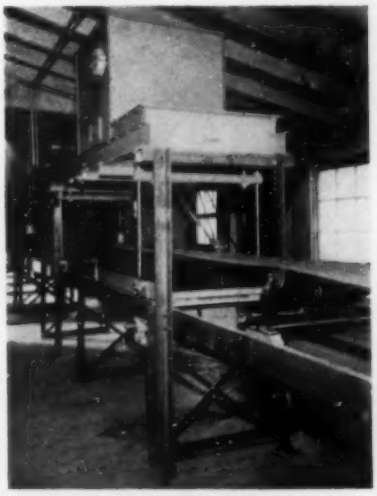

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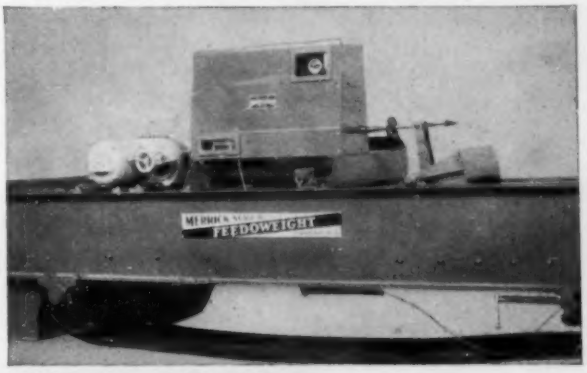


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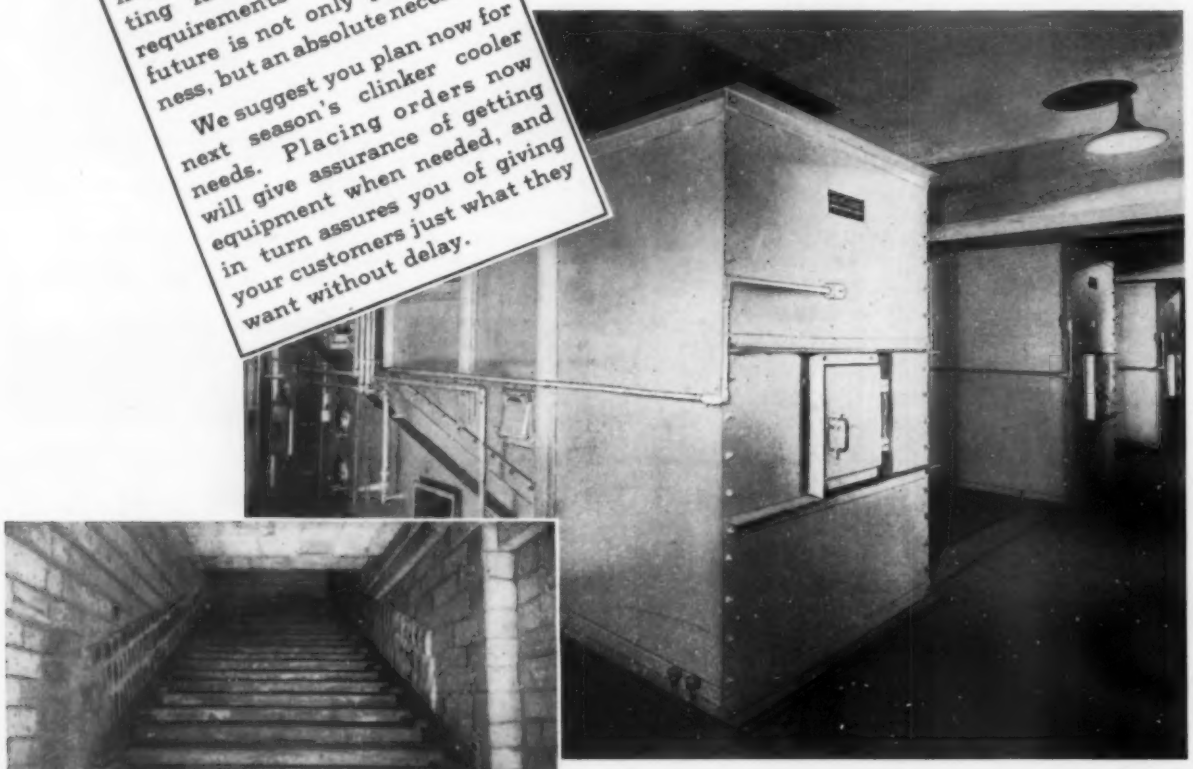

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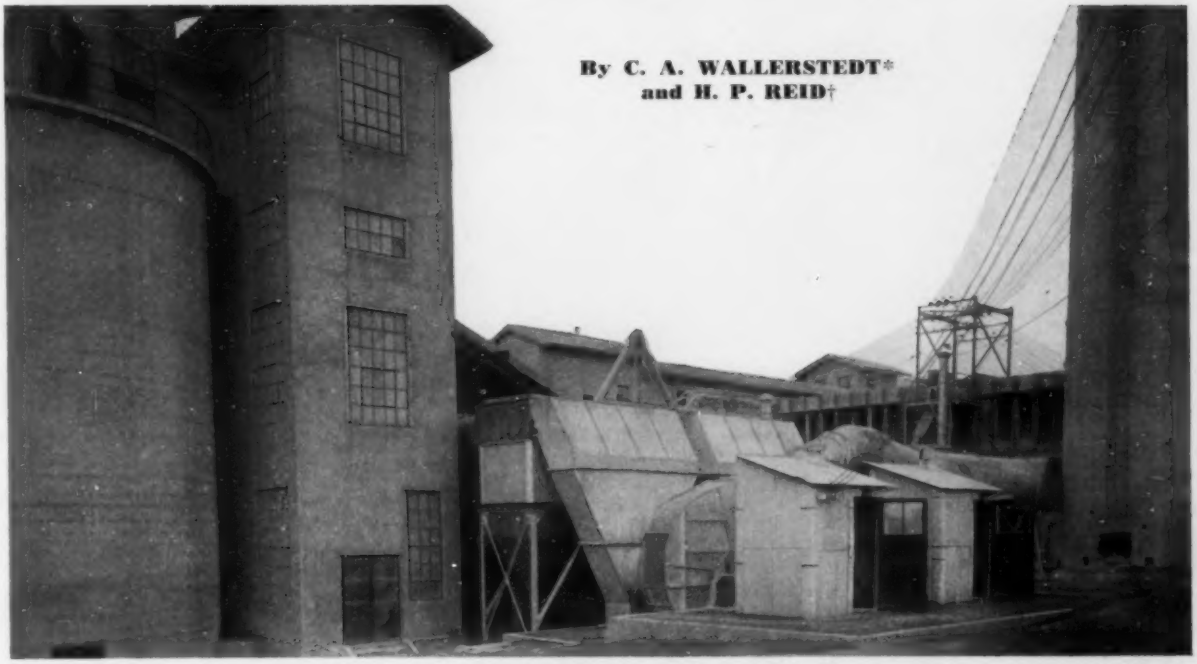
# From One to Five Types of Portland Cement

By C. A. WALLERSTEDT*
and H. P. REID†



Two dust collector units, center, and one induced draft fan remove dust from the dryer-fan system. Second induced fan is hidden by the motor houses

BUILT IN 1928-9, the Waco, Texas plant of the Universal Atlas Cement Co., is essentially a single unit plant consisting of one raw grinding compeb mill, one kiln, one clinker-cooler and one clinker grinding compeb mill. At the time it was built the company contemplated manufacturing only standard portland cement. Consequently, minimum storage capacity of 20,000 bbl. for clinker and 75,000 bbl. for cement was required. The clinker storage was merely a surge reservoir between the kiln and clinker grinding mill. The plant was designed to produce approximately 2000 bbl. per day.

The plant was built to operate on dry process and with purchased power. Two rotary dryers were installed to use waste kiln gases to dry the shale and limestone, both of which contain moisture ranging from 10 percent to extremes of more than 20 percent. A draft fan induced these gases through the dryers and discharged to a 175-ft. concrete chimney. This fan was capable of handling practically all of the kiln gases at 2000 bbl. daily production.

*Superintendent, Waco plant.
†Operating Engineer, Universal Atlas Cement Co., New York, N. Y.

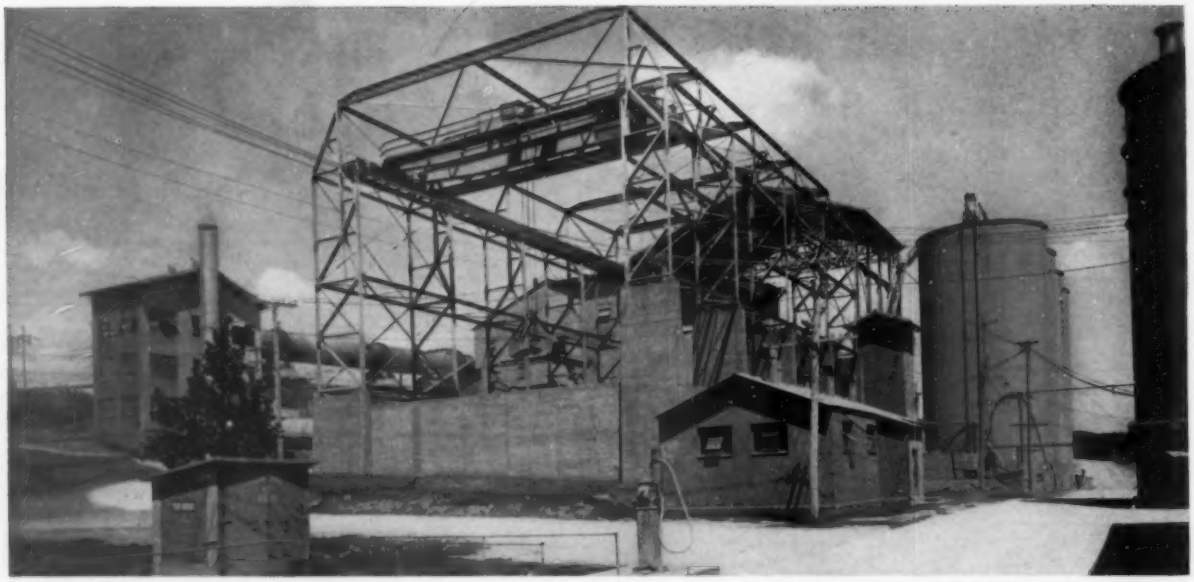
Soon after starting the plant it became evident that the kiln was capable of burning considerably more than 2500 bbl. per day. At the increased production rate, the induced draft fan could handle about 80 percent of the kiln gases. This amount of waste gas was not sufficient at all times to meet plant requirements for drying shale and limestone. This deficiency made it necessary to burn raw fuel (natural gas) at the dryers to supplement the waste heat, particularly when the shale and limestone were exceptionally wet from heavy rains.

The excess kiln gas over that which could be induced through the dryers with the original fan, flues and ducts was wasted directly to the concrete chimney by a branch flue. A large refractory damper was automatically raised or lowered in this flue to throttle this wasted kiln gas for control of kiln draft. The draft control was quite effective when the dryers were operating uniformly on materials of uniform moisture content, but was sluggish and at times deficient in control when shale or limestone fed to dryers varied widely in moisture content.

**Improvements at Waco, Texas plant of Universal Atlas Cement Co., include dust collectors on the rock dryers, the installation of a quenching type clinker cooler, more efficient grinding equipment, and more storage**

With the original installation, clinker discharged by the kiln fell approximately 25 ft. through a vertical cooling tower into the upper end of a 10 ft. diameter by 140 ft. long rotary cooler. This tower contained a number of staggered shelves which retarded the fall of the clinker and improved the contact of hot clinker with rising currents of air being drawn into the kiln as secondary combustion air.

Increased clinker production imposed greater thermal burdens upon the cooling equipment than had been planned in the original design. This thermal overload resulted in deterioration of the vertical cooling tower, and clinker was discharged from the rotary cooler at tempera-



General view of Waco, Texas plant. Clinker storage extension in the center, new cement silos, right background, and kiln and operating building, to the left

tures too high for efficient clinker grinding. Note above that clinker storage was provided only for short time accumulation of clinker to facilitate clinker-grinding operations, and was insufficient as cooling space to reduce temperatures of clinker from the overloaded rotary cooler to those economical for grinding.

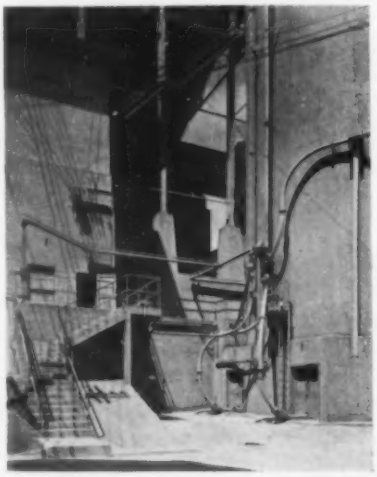
In the last few years the company has been influenced by the market demands to manufacture regularly, five or more types of portland cement instead of only one for which the plant was built. In order to accommodate the plant to this increased demand it has been necessary to increase clinker-storage capacity 100 percent, increase cement-storage capacity by 100,000 bbl., increase packing capacity from three to four machines, and to improve the flexibility of the plant in general.

### Storage Added

The first major improvement—the erection of 100,000 bbl. capacity cement-storage silos — was completed several years ago and described in November, 1936, issue of ROCK PRODUCTS. At the time, recent as it was, when these last silos were erected, the requirements called for additional storage capacity rather than the isolation of many special cements and the flexibility for handling several types at the packing machines.

In the Spring of 1939 the fourth packing machine was installed in such a way that it could pack special types of cement and keep each type segregated, including the spill from the packing operations. A few months later a separate 6 in. pipe line was installed between the new cement-storage silos and the packing room with arrangements to discharge from this line into any of the four packer bins; also the Fuller-Kinyon pipe line from the original cement-storage silos was altered to provide isolation of its transport into any one of these four bins. Distribution to these four bins is controlled by pneumatic valves actuated from a special switchboard.

By the summer of 1939, demands on the plant for the various types of cement to be manufactured in relatively small batches and at frequent intervals made it necessary to extend the 68- x 90-ft. clinker storage an additional 60 ft., and to enclose this storage with side walls 15 ft. high to retain the clinker in space accessible to the bucket from the overhead bridge crane. This work was completed early in 1940.



West end of new cement silos showing cement recirculating pipeline and transport line to packing room

### Clinker Cooling

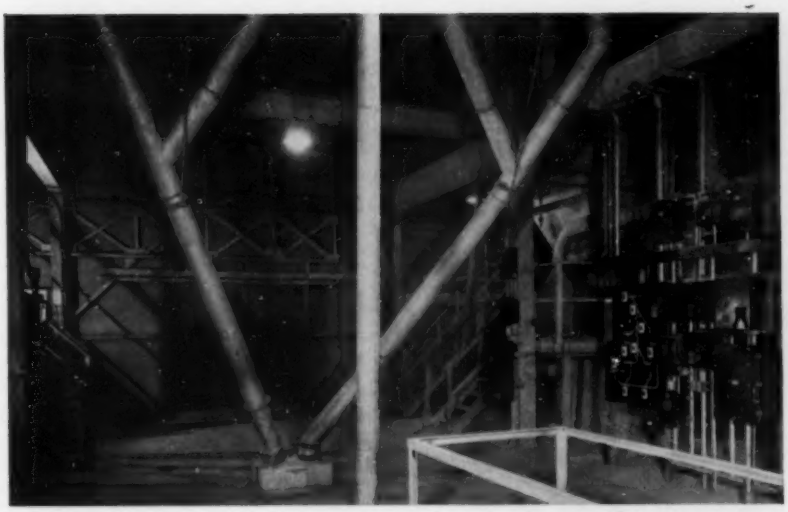
In the winter and spring of 1940, alterations were made to the waste-heat drying and gas-handling equipment. Improvements and additions also were made to the clinker-cooling machinery. Two induced draft fans, one on each rotary dryer, were installed to replace the inadequate single fan. New ducts of ample capacity were installed between each dryer back-housing and these fans. Also a nest of Multiclone dust collectors was installed on each dryer-fan system. These fans have so increased the gas flow through the dryers that it is no longer necessary to waste kiln gas direct to the chimney, nor is it necessary to burn raw fuel to augment waste heat for rock drying. With the new system, the kiln draft is much more stable and is automatically controllable.

### Dust Recovery

Prior to these improvements in waste kiln-gas handling and rock-drying equipment, dust deposited in the flue between the kiln and the dryers and that thrown out between dryer back housings and chimney was conveyed from its source by screws and delivered to the dried rock storage silos. The dust deposited in the flues between the kiln and the dryers was red hot and resulted in high maintenance cost of the screw conveyors. This fine material, when mixed with the dried rock, caused

considerable dusting and made difficult the control of feed to the proportioning scales and to the rock-grinding compeb mill. At the time the waste gas-handling equipment was rebuilt, the dust-handling screw conveyors under the hot flues were replaced with drag-chain conveyors. The return strands of these drags are outside the conveyor housings, thus cooling the chain. This has greatly reduced conveyor maintenance.

A Fuller-Kinyon pump delivers the reclaimed dust from flues and collectors to a dust bin installed adjacent to the rock grinding mill. This bin has a capacity of 30 to 40 hours of dust accumulation. Withdrawal from this bin is by feeder consisting of a screw and choker, driven by a variable speed motor and discharging into the conveyor to the air separator, which is close-circuited with the rock-grinding compeb mill. This system is working very satisfactorily as it feeds the reclaimed dust at predetermined rate into the compeb-mill-air-separator circuit, intimately mixing the dust with freshly ground composition.



Interior of packing room. Control board is shown in the right foreground. With this control, cement from bins of either stock house can be positively discharged to any of the four packer hoppers

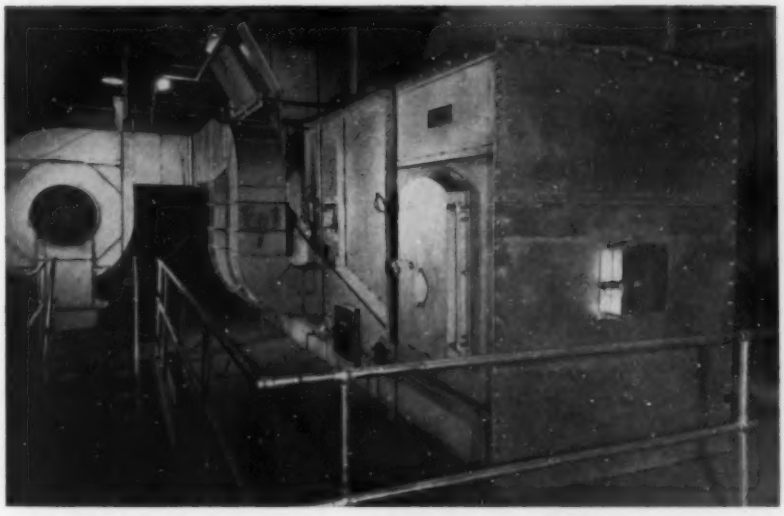
### Clinker Quencher

The old original clinker-cooling tower described above had deteriorated to a condition making it necessary to rebuild or replace. It was decided to install a section of quenching type clinker cooler to replace this cooling tower and in this way to increase clinker-cooling capacity. This quenching cooler, installed in the Spring of 1940 is of sufficient size to preheat all air used for combustion in the kiln and, in so doing, to reduce the temperature of the clinker to 900 to 1000 deg. F. Air enters the kiln at temperatures of 1300 to 1400 deg. F. Before this quencher was installed, air from the rotary cooler entered the kiln at approximately 700 to 800 deg. F.

The quenching cooler delivers the partially cooled clinker to the rotary cooler which further cools it to near atmospheric temperature. All air passing through the rotary cooler is wasted through a separate stack.

The action of the rotary cooler had rubbed material from the surfaces of the clinker, thus forming very fine dust. This dust had entered the kiln with the preheated air and so fogged the kiln atmosphere that it was difficult for the operator to see beyond the discharge half of the burning zone. Use of the quenching cooler has clarified the atmosphere so the operator can see well back into his kiln.

Originally, natural gas used as kiln fuel was mixed with primary combustion air in a conventional type burner. A blast fan drew air from the vertical cooling tower through a cyclone to remove the heavier dust particles and forced this air through the gas mixer and burner into the kiln. This burner has recently been replaced with a direct jet burner, thus eliminating the blast fan. This change has improved burning conditions considerably.



Air-quenching clinker cooler showing blast fan, and distributing ducts to undergrate chamber

### Grinding Improvements

The 8- x 7- x 45-ft. clinker-grinding compeb mill was, like other units of the plant, designed for much lower capacities than present production. As changes in specifications required finer and finer grinding, this mill became the outstanding bottleneck in plant operations.

In the summer of 1940 the 180-r.p.m., 900-hp. synchronous motor driving this compeb mill, was replaced by a 200-r.p.m., 1000-hp. motor, thus increasing the rotary speed of this mill from 19.9 to 22.1 r.p.m. The new motor was built to fit on the base plate used for the 900-hp. motor, thus making the two motors interchangeable for this drive.

The air-separator circuit was changed at the same time the larger motor was installed. Originally, the first or breakdown compartment discharged to a peripheral screen around the mill. Oversize material was returned to the first compartment and the screen fines were fed to the second compartment. When the speed of the mill was increased, the peripheral screen and outside scoops were removed and the mill changed for through-flow of material for the entire length. The separator rejects were returned to the mill with new clinker feed into the first compartment.

# Effect of Dispersion On Cement Raw Materials

By H. L. KENNEDY and F. J. MARDULIER*

THERE ARE two features of portland cement raw materials size distribution which are frequently encountered in actual practice and are considered to be definitely undesirable: First, an excess of the very small sizes—say 5 microns and less; and second, an excess of oversize, namely, plus 200-mesh. Opinion appears divided as to the detrimental effect of the material passing the 100- and retained on the 200-mesh sieves. However, there is complete agreement regarding the undesirability of kiln feed coarser than 100-mesh.

It is generally agreed that the material lost through the kiln stacks is the ultra fines produced during the grinding operation. Obviously, if the amount of these is decreased, there will be less stack dust loss.

Obvious, too, is the fact that more B.t.u.'s of heat energy and somewhat higher kiln temperatures are required to sinter and properly combine large particles than are necessary with very fine particles. However, it is mechanically impossible to do anything but apply an average amount of heat energy at an average kiln temperature that experience has shown to be best for the major part of the raw materials being burned. As a result too much heat is actually applied to the very fine particles and not enough is applied to the oversize. By providing the kilns with raw feed having less of these extreme sizes, the melt within the kilns is more easily controlled and a better, more uniform clinker is produced at possibly a slightly higher kiln production rate.

In this connection, Table 1 is of interest. Where the dispersing agent (RDA) was interground with the raw materials, the clinker burned was easier to grind as evidenced by the higher clinker mill production rate. Also clinker quality was improved as evidenced by the lower free lime and higher strengths obtained at identical surface area. Unfortunately, it was impossible to obtain an accurate measurement of kiln production at this plant. However, in Table 2 under "Remarks" it will be seen that at one plant where kiln production was easy to determine, a definite increase in kiln production resulted from dispersion of the kiln feed.

Air separators have been in use for several years, principally as a means of increasing raw materials fineness and/or production rate. The fact that air separation or classification is at the same time a mechanical corrective for improper particle size distribution has only lately begun to be realized. Because of either the higher fineness to which raw materials are generally ground in closed circuit or because of the effect of air separation in producing a more suitable particle size distribution, the use of air separators has definitely contributed to the quality of modern portland cement clinker.

Air separation with its consequent return of oversize material to the grinding mills increases the ratio of impact to attritional grinding. A theoretical explanation of the effect of changing the ratio of impact to attrition is given by the grinding research of Lincoln T. Work† and others, which has shown that particle sizes below one-quarter of the maximum size are produced largely by attrition or some secondary type of particle breakage. Hence, grindability remaining constant, a reduction in the ratio of attritional or secondary grinding to impact grinding would necessarily produce less flour or dust, and would also produce less oversize material for the same surface area.

Where air separators are not used, the same desirable effect on particle size distribution may be obtained by the use of a suitable aqueous dis-

TABLE 1—EFFECT OF INTERGRINDING WITH RDA ON CLINKER QUALITY
(Plant No. 136)

| Type Clinker | Date | Finish Mill Bbl./Hr. | Klein Surface Area | Tensile Strength—lbs./sq.in. 1-day | 3-day | 7-day | 28-day | Free Lime |
|---|---|---|---|---|---|---|---|---|
| Normal | 5/1-5/28/39 | 26.7 | 1430 | 167 | 272 | 337 | 440 | 0.61 |
| RDA | 5/29-6/14 | 31.3 | 1470 | 195 | 287 | 383 | 463 | 0.44 |

*Manager and field engineer, respectively, Cement Division, Dewey and Almy Chemical Company.

†"An Analysis of Crushing and Pulverizing Processes," Lincoln T. Work, A.S.M.E., 1932.

TABLE 2—PRODUCTION INCREASES OBTAINED AT VARIOUS CEMENT PLANTS WITH RDA

| Plant | Location | % Incr. | Bbl. Ground During Test | Type of Hookup | Remarks |
|---|---|---|---|---|---|
| 30 | Lehigh Valley | 26 | 35,000 | Compebs—open circuit | Finish mill production increased 15% |
| 93 | Middle West | 96 | 5,000 | Preliminators and tube mills | Agglomeration of raw materials eliminated |
| 103 | Southeast | 15 | 60,000 | Preliminators and tube mills | Needed power made available for clinker grinding. |
| 48 | Lehigh Valley | 43-90 | 200,000 | Preliminators and tube mills | More uniform kiln feed |
| 121 | Southeast | 28 | 60,000 | Preliminators and tube mills | — |
| 19 | Middle West | 25 | 50,000 | Compebs—open circuit | Kiln production increased 6% |
| 20 | Middle West | 25-40 | 30,000 | Compebs—closed circuit | — |
| 136 | West | 24 | 28,000 | Preliminators and tube mills in closed circuit | Finish mill production increased creased 17% |
| 131 | West | 50-80 | 85,000 | Preliminators and tube mills in closed circuit | — |

persing agent (RDA), which incidentally will also function as a grinding aid. This apparently is due to dry dispersion which in turn has a lubricating effect on the grinding action of the balls. It should be noted that other dispersing agents not of the aqueous type have been tried principally as raw grinding aids, but their use has resulted in extreme and objectionable dusting.

But of still greater interest is the fact that the effects of air separation and aqueous dispersion are additive, as demonstrated by actual mill experience. Results of experimental grinds at three plants where air separators are in use on the raw end demonstrate quite clearly that not only is particle size distribution still further improved, but separator efficiency is also improved by intergrinding a dispersing agent with the raw materials.

The effect of an aqueous dispersing agent on clinker mill grinding efficiency with its attendant increase in mill production rate has already been brought to the attention of the cement industry through the medium of TDA, a combined catalyst and dispersing agent for portland cement, which has been used with increasing success for the past eight years. However, in grinding raw materials, a catalyst is obviously superfluous, and only adds unnecessary cost to the grinding of raw materials, since both catalysts and dispersing agents, being organic, are completely volatilized in the burning operation. It was with this thought in mind that an inexpensive dispersing agent known by the trade name of "RDA" was recently made available to the industry.

### Introduce Dispersing Agent As Near Mill As Possible

For best results, it is essential that RDA be uniformly distributed throughout the mill load so that a mono-molecular film of RDA covers the surface of each particle being ground. For this reason and also to assure more accurate proportioning of the RDA by weight of raw material, RDA is added as a water solution at a point as near to the tube mill or compeb mill as possible.

It is evident from the data available to date that raw materials vary considerably in their response to treatment by RDA. As a result, production increases obtained with RDA cover a large range of percentages—from approximately 15 percent to 100 percent. However, the one plant at which only a 15 percent increase in production was obtained has been using RDA steadily for the past year because it was found that an existing unbalance was corrected. This in turn effected an appreciable saving in plant operation, in operating costs and far more than compensated for the cost of the RDA used.

A brief summary of the results obtained at the nine cement plants where RDA has been successfully tried is given in Table 2. It should be noted that every type of raw grinding hookup is involved, and that sizeable increases in production rate are obtainable with any or all of the grinding hookups in question. For example, it is shown that just as great production increases were obtained in closed-circuit operation as in open circuit. However, it also appears that greater increases are obtainable in two-stage grinding hookups than in compeb mills, though the increases with the latter type mills are sufficiently great to justify the use of RDA.

It is felt that the data presented in Table 2 are as accurate as can be expected under the conditions of raw material and production control existing at most cement plants. The reliability of the data is attested to by the fact that five of the tabulated plants are using RDA commercially today with the same satisfactory results as were obtained during the experimental grind. In every case the test grinds were of sufficient duration to iron out day-to-day inaccuracies and variations in raw material grindability. The fourth column in this table gives the number of barrels ground with RDA in each case. From the point of view of operating time, the experimental grinds ranged from two weeks to two months in duration.

### The Results

Detailed data for two typical experimental grinds are presented in Figs. 1, 2 and 3.

Fig. 1 gives a chronological breakdown of the average results reported in Table 2 for plant No. 131. The average amount of RDA used during this

*(Continued on page 83)*

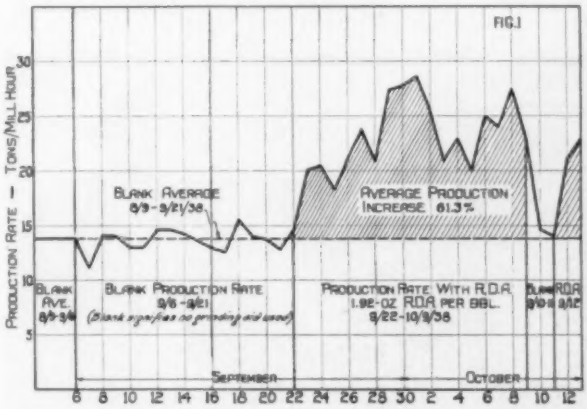
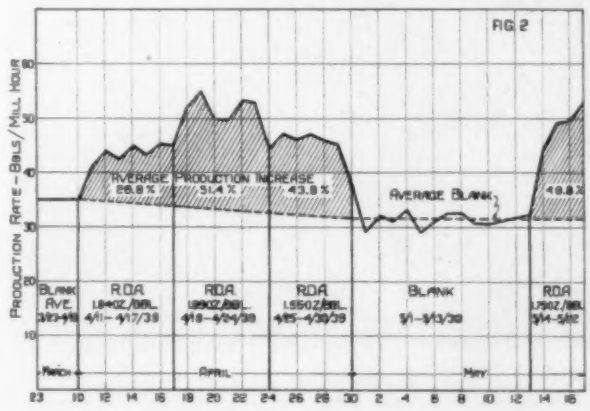


FIG. 1
PRODUCTION RATE — TONS/MILL HOUR
BLANK AVERAGE 8/9 - 9/21/38
AVERAGE PRODUCTION INCREASE 61.3%
BLANK AVE. 8/9-9/8
BLANK PRODUCTION RATE 9/8 - 9/21
PRODUCTION RATE WITH R.D.A. 1.92-OZ R.D.A. PER BBL. 9/22-10/9/38
SEPTEMBER
OCTOBER



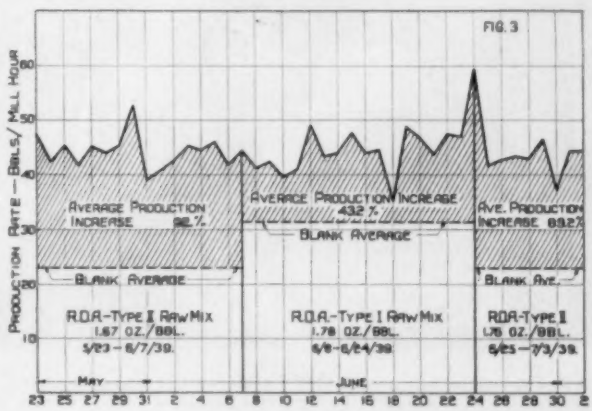



FIG. 3
PRODUCTION RATE — BBLS./MILL HOUR
AVERAGE PRODUCTION INCREASE 32.7%
BLANK AVERAGE
AVERAGE PRODUCTION INCREASE 43.2%
BLANK AVERAGE
AVE. PRODUCTION INCREASE 69.2%
BLANK AVE.
R.D.A.-TYPE I RAW MIX 1.67 OZ./BBL. 5/23 - 6/7/39.
R.D.A.-TYPE I RAW MIX 1.78 OZ./BBL. 6/8 - 6/24/39.
R.D.A.-TYPE I 1.76 OZ./BBL. 6/25 - 7/3/39.
MAY
JUNE

**Fig. 1: Production increase obtained with RDA at a far western cement plant. (Shaded area indicates production increase over usual production rate.) Fig. 2: Production increase obtained with RDA at a Lehigh Valley cement plant. Fig. 3: Another increase in production in the same plant after further experience with RDA**

# Crushed Stone Directors at Hot Springs, Va.

TWENTY MEMBERS of the board of directors of the National Crushed Stone Association, and several guests, met for their annual summer session at Hot Springs, Va., July 10. It was the best attended meeting in several years. In addition to a good day's work twelve members and guests found time to squeeze in a golf tournament (see opposite page).

One of the first actions taken was the adoption of a heartfelt resolution expressing the sorrow of the board upon hearing of the death of Charles M. Doolittle, Hamilton, Ont., who had been a director for many years and had many intimate friends among the members.

A good share of the time was devoted to discussion of a special program for the next annual convention, to be held in Cincinnati, Ohio, Feb. 2-4 or 5. It is quite possible that the convention will include four days, allowing the extra day for special sessions on agricultural limestone and bituminous pavement mixtures.

The next convention will be the 25th and every effort will be made to make it particularly notable. All the old timers will receive urgent invitations to attend and there will be other special events. A committee of the board under the chairmanship of Otho M. Graves, past-president, is giving much attention to the program.

### Engineering Activities

A. T. GOLDBECK, engineering director, submitted a progress report, in part as follows: "It was inevitable that the rapidly changing construction picture attending a greatly accelerated program of defense would affect the duties and activities of our Association. Certainly, our engineering duties have differed greatly during the first six months of this year as compared with those of previous years. There has been less time available for technical writing due to the necessity for conferences with defense officials both in Washington and elsewhere and due also to the time required in preparation for those conferences. No phase of our work has seemed more urgent than that relating to defense. Construction contracts are proceeding rapidly and when action by us has been needed at all, it has required prompt and intensive action. However, in spite of this necessity of revising our usual plan of activities, attention to research, to committee work and to such other endeavors as might be of benefit to stone producers has not been neglected."

He then outlined some of this special work such as consultation on concrete for a bomb-loading plant; laboratory tests which resulted in the adoption of stone sand for a water-supply dam; consultation and research on aggregates for large naval dry docks, including a design for a tremie (for placing underwater concrete); conferences with War and Navy Departments on the design of concrete mixes; conferences with Army, Navy and Civil Aeronautics authorities on the pavement design for airport runways, etc.

Other research work had to do with the beam resistance of crushed stone and gravel concretes when subjected to repeated loading up to 60, 70, 80 and 90 percent of the modulus of rupture of the concrete as it is ordinarily determined by breaking a beam by the method of loading it once only up to its breaking point. Mr. Goldbeck said: "The results obtained thus far indicate that there is a difference

Top row, left to right: Mrs. "Bill" Andrews and "Bud" Schmidt, "Ted" Cook, and J. Harper Fulkerson and L. W. Shugg. Bottom row, left to right: "Bill" Andrews, Mr. and Mrs. Charles Krause, Fred Braun, and "Reg" Boyd, in his golf (pyjamas)

Russ Rarey putts (and sinks it)

in the behavior of crushed stone and gravel concrete when tested by this method. Concrete roads are loaded repeatedly by traffic and other agencies and evidently the repeated use of heavy loads brings about a weakening effect which is more pronounced in the case of the gravel than in the case of the limestone used in our tests. We are pursuing this matter further and will use different aggregates in this investigation. We have felt that the present method of determining the relative strength of beams does not bring out the true merits of the respective aggregates such as will be brought out by the use of repeated loads."

Al Worthen putts (and sinks it)

### Association Activities

J. R. Boyd, administrative director, reported on the defense highway program to date and on W.P.A. and defense construction. He remarked: "There is abundant evidence that W.P.A. is becoming less a relief agency and more a construction agency, this trend unquestionably being greatly stimulated by the defense construction program. Though recently orders have been issued requiring substantial reduction in W.P.A. payrolls, it is nevertheless true that such reductions are by no means as great as would reasonably be expected in view of the decrease in unemployment. The answer lies in the fact that W. P.A. has turned to the construction of necessary defense projects. An inescapable conclusion to be drawn from these facts is that Administration policy contemplates the retention of a substantial organization ready to function quickly in relieving post-defense unemployment."

Otho Graves putts (and ? —we didn't say it, he did, though)

"During the past year we have had member companies in a number of instances bring to our attention W. P.A. projects in which it was contemplated that crushed stone would be produced by W.P.A. We have filed a protest with the appropriate officials on the basis of their published policy and in many such cases the contemplated erection of crushed stone plants has been abandoned.

Mr. Boyd warned of a possible car shortage this fall. He said: "The following factors definitely point to a freight car shortage: The recent coal strike reduced coal shipments by approximately 80,000 cars. The diversion of tankers and other coastwise shipping to Britain has placed an extra burden on the rails, particularly in the East. Heavy grain movements will further complicate the picture. The automobile industry has already been requested to cut its production for passenger cars and trucks by 20 percent and further requests for cuts are imminent to as high as 50 percent. Unless truck production is exempted from these cuts a definite shortage in trucking capacity may easily develop with the consequent increase in the load on rails. The weekly peak of carloadings this fall is estimated at 950,000 which is about 110,000 greater than last year's peak which, as we all know, was handled with but a slim margin of safety."

## Seamen in Sand and Gravel Industry

At a conference held under the auspices of the National Sand and Gravel Association in Washington, D. C., July 23, some 20-odd operators conferred with a representative of the Administrator of the Wage and Hour law, in regard to the definition of a "seaman."

Stated in substance, the situation with reference to the exemption of seamen, so far as the sand and gravel industry is concerned, is now as follows: Employees on our towboats and tugs were exempted under the provisions of Interpretative Bulletin No. 11; barge captains, mainly employed in our industry along the eastern seaboard, were held by the Federal Circuit Court of Appeals to be exempted as seamen; and employees on dredges and other floating equipment, subject to later determination of exemption in specific cases, will henceforth be regarded as being covered by the law whenever the operations of the company cause the law to apply.

## Shovel With All-Welded Boom

In the illustration is shown a new 2½-cu. yd. Marion electric shovel recently placed in the quarry of Southwestern Portland Cement Co., Victorville, Calif. It has an all-welded steel boom, and is known as type 4101. Another addition to the quarry equipment is a Bucyrus well drill for 8- and 10-in. holes. Crawler treads on the well drill were replaced with wheels.

Electric shovel in quarry of Southwestern Portland Cement Co., Victorville, Calif., has all-welded boom and bucket of 2½ cu. yd. capacity

## Production Rising

The portland cement industry in June produced 15,222,000 bbl., shipped 16,109,000, and had in stock at the end of the month 21,863,000, according to the Bureau of Mines, U. S. Department of the Interior. Production and shipments showed increases of 21.9 and 21.8 percent, respectively, as compared with June, 1940. Stocks at mills were 8.9 percent lower than a year ago.

In the following statement of relation of production to capacity the total output of finished cement is compared with the estimated capacity of 156 plants at the close of June, 1941 and 160 plants at the close of June, 1940.

RATIO (PERCENT) OF PRODUCTION TO CAPACITY

| | June 1940 | June 1941 | May 1941 | Apr. 1941 | Mar. 1941 |
|---|---|---|---|---|---|
| The month.. | 58.8 | 74.0 | 69.4 | 59.3 | 49.8 |
| The 12 months ended .... | 48.1 | 58.3 | 57.4 | 56.5 | 55.6 |

# Depreciation in Cement Plants

**Sound depreciation policy will determine whether new improvements are justified**

By W. R. BENDY

DEPRECIATION COSTS are sometimes regarded as mere paper figures because, unlike a creditor, they do not demand cash payments every year. Nevertheless, they are inescapable and will ruin an industrial enterprise if neglected.

A $10,000 soft drink stand at the Worlds Fair is worthless when the fair closes. The owner must earn at least $10,000 before there can be any profit. In a cement plant, depreciation is slower but just as inevitable.

If no improvements are made to a plant for 20 years, it may be unable to meet changed conditions. Unless adequate depreciation reserves have been set aside for the replacement of obsolete equipment, the plant then stops operations and the original investment is found to have disappeared.

Annual depreciation is merely the original cost divided by the estimated life. Trucks may have an estimated life of only four years, heavy machinery 15 or 20 years, and buildings up to 50 years. Thus, the depreciation on an entire plant is made up of many items, computed at different rates.

Depreciation affects corporation profits, on which Federal taxes are paid. On this account, the life assumed for various types of equipment must be approved by the Treasury Department. This results in a fair degree of uniformity in the industry.

The relationship between capital investment and depreciation cost per barrel is simple. If a new plant costs $4.00 per barrel of annual capacity and has an average depreciation rate of 5 percent, its depreciation cost at full capacity is $0.20 per barrel. Other combinations of values are indicated in Fig. 1.

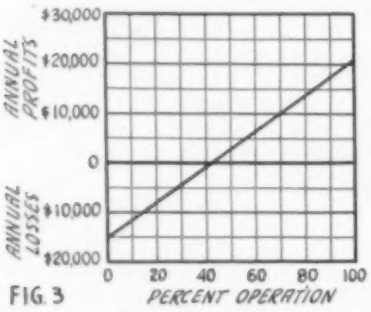


FIG. 3

**Fig. 3: Showing operating percentages which result in either profits or losses**

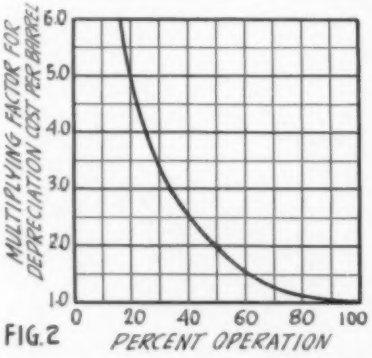


FIG. 2

**Fig. 2: Curve indicates multiplying factor for depreciation cost per barrel based on operating percentage of total plant capacity**

Depreciation is the result of age rather than work performed. It is made up chiefly of obsolescence and, to a lesser extent, of deterioration due to age. It is, therefore, an expense which goes on whether a plant operates or not. The result is that depreciation cost per barrel varies inversely as the percentage operation. This is shown in Fig. 2.

There are two general methods of utilizing depreciation reserves. One method is to make as few improvements as possible over a period of years, allowing the reserves for depreciation to accumulate as part of the working capital and then, when the time is ripe, to rebuild the plant completely. This has the advantage of giving a new, modern plant, unhampered by the old design. The disadvantage is that improvements cannot be made from year to year as conditions change.

The other method is to carry on a continuous modernization program. This allows new methods and requirements to be adopted promptly,

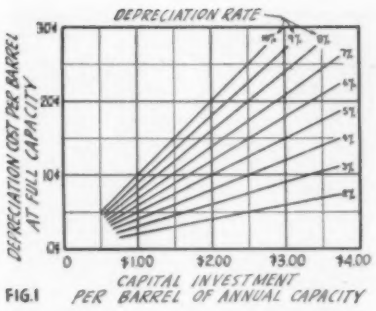


FIG. 1

**Fig. 1: Graph showing the depreciation rate with relation to capital investment per barrel of annual capacity and depreciation cost per barrel at full plant capacity**

but it usually has the disadvantages of higher construction costs and unsatisfactory compromises with the original plant layout.

Plant improvements may be divided into two classes, which sometimes overlap: (1) Changes to improve the product; and (2) Changes made to lower the production cost.

Improvements in the first class are sometimes required to meet new specifications and customer requirements. If they are not made when necessary, sales will decrease. The increase in annual depreciation charges resulting from such plant changes is simply the added capital investment divided by the estimated life. This added expense is the price of improving the product. Any remaining undepreciated book value in the old equipment can be written off if the machinery is dismantled, or allowed to depreciate at the normal rate if the machinery is left in place. Whichever method is adopted, the full value of the old equipment must eventually be paid out of profits.

Improvements in the second class, which are made in order to lower production costs, are justified only if they show sufficient savings after deducting depreciation. This should be computed on the probable rate of production rather than on maximum capacity.

As an example, a new finish grinding department may be proposed; cost, $300,000 installed; power saving, 3 kw.h. per barrel compared with existing equipment; cost of power, $0.008 per kw.h.; annual capacity, 1,500,000 barrels; estimated life, 20 years.

Annual Power Savings = 1,500,000 × 3 × $0.008 = $36,000.

Annual Depreciation = $300,000 ÷ 20 = $15,000.

At full capacity, there is a net return of $21,000 on an investment of $300,000, after deducting depreciation. At 70 percent operation, the net profit

is only $10,200, and at 40 percent operation, there is a slight loss. The relationship of profit to percentage operation in this example is shown in Fig. 3.

When operation at less than full capacity is expected, it is sometimes profitable to modernize only some of the units. In the foregoing example of a 1,500,000-barrel plant, there may be three finish grinding units, each of 500,000 barrels annual capacity. The anticipated market may allow the following operation: One unit, 93 percent of the time; two units, 60 percent of the time, three units, 33 percent of the time, and average for entire plant, 62 percent operation.

An example of the calculation of costs and profits on each separate unit, considered separately, is shown in Table A.

The net returns would probably be too low to justify improving the entire finish mill. The installation of a single unit might be justified, but a second unit would show a lower return and a third would result in a loss.

When improvements are proposed for the purpose of lowering production cost, there may still be some undepreciated book value in the equipment which will be superseded. If the old equipment is written off, its remaining value must be taken as a loss. If it continues to be charged off annually as depreciation, the latter will persist as an item of cost until the book value disappears. In either case, the added burden is due to the selection, years before, of the original equipment, or to over-estimating its life, or to unforseen changes in conditions.

The remaining book value of the old equipment does not affect the desirability or soundness of the new investment, which is justified, or not justified, solely by the savings which it will accomplish. However, the remaining book value represents previous investments which have not been entirely amortized out of profits and returned to working capital as depreciation reserves. Consequently, it may make the improvements less feasible because of lack of reserves available for reinvestment.

# Effect of Dispersion On Cement Raw Materials

*(Continued from page 79)*

grind was 1.92 ounces of RDA solids per 600 lb. of raw materials at a present day cost of 0.64c. per bbl. The RDA was added as a solution to the air separator rejects which constitute the feed to the 6- x 22-ft. tube mills used at this plant. One Bradley mill and three Kominuters, in closed circuit with Hummer screens, were used as preliminators.

It will be observed in Fig. 1 that there was a marked increase in production rate almost immediately upon the addition of RDA on September 22. During the first few days, this increase was not as large as could have been obtained because the mill feed screws did not run sufficiently fast. The subsequent still greater increase in production rate was obtained as a result of speeding up the mill feed screws. Tube mill hours were reduced from 38 hours to 24 hours per day. It is interesting to note the marked decrease in production for October 10 and 11, when no RDA was used in order to check the grindability of the stone.

Figs. 2 and 3 give the results obtained at plant No. 48 during a similarly extended experimental grind. In this case also it was found that the production rate dropped to normal very shortly after purposely discontinuing the RDA, and remained at normal until the RDA was used again. One fact of great practical significance is demonstrated by Fig. 3, which shows the results obtained when grinding raw materials for both Type 1 and Type 2 cement. It is evident that as long as the RDA was used, the production rate was very nearly the same for both types of raw materials, whereas ordinarily an appreciable reduction in production rate is experienced at this plant when grinding Type II raw mix.

Approximately 1.75 oz. of RDA solids per 600 lb. of raw material were used during this experimental grind with an average increase in production of 43 percent for Type 1 raw materials and 90 percent for Type 2 raw materials. These increases were obtained at a present-day cost for RDA of 0.5c. per 600 lb. of raw material. This plant is today using RDA in amounts of 0.5 to 0.7 oz. per 600 lb. of raw material, and as a result is obtaining a 25 percent increase in production at a cost of 0.17c. per bbl. of finished cement.

In order to give a complete picture of the results obtained to date with RDA, the authors are constrained to point out that two experimental grinds were made in addition to those given in Table 2, which at present writing must be classed as failures. In both cases, however, there were very definite mechanical difficulties which made it impossible to take full advantage of dispersion of the raw materials. These mechanical difficulties are being corrected; following this further trial grinds are contemplated, which it is anticipated will produce satisfactory results. These two apparent failures notwithstanding, it is evident that the possibilities arising in connection with the use of a dispersing agent in dry raw grinding have merely been touched upon and definitely merit the attention of the cement industry and all industries where dry raw grinding is required.

In conclusion, it is suggested that the chief advantage of a grinding aid for raw grinding or finish grinding lies in the ability of a cement plant operator to use such a material only if and when its use is justified or necessary. When not needed its use can be discontinued with no cost to the operator for idle equipment and no increase in overhead charges.

TABLE A: COSTS AND PROFITS ON THREE FINISH MILL UNITS

| Unit | Cost | Percent operation | Annual power saving | Annual depreciation | Annual profit | Percent return |
|---|---|---|---|---|---|---|
| (1) | $120,000 | 93 | $11,100 | $ 6,000 | $5,100 | 4.3 |
| (2) | 90,000 | 60 | 7,200 | 4,500 | 2,700 | 3.0 |
| (3) | 90,000 | 33 | 4,000 | 4,500 | 500* | 0.6 |
| TOTAL | $300,000 | 62 | $22,300 | $15,000 | $7,300 | 2.4 |

*Loss

## Use and Care of Wire Rope

The American Steel & Wire Co., Cleveland, Ohio, recently brought out a 50-page booklet giving helpful information and suggestions for the proper handling and maintenance of wire rope. Subjects covered in the booklet include: unreeling and uncoiling, seizings, attaching of clips and sockets, splicings, etc.

## Ready Mix Expansion

Cook and Co., Portland, Maine, has enlarged and remodeled its retail plant at Scarboro, Maine, to take care of demands made upon it for national defense construction. New equipment includes transit mixers.

# Specification Changes For Rock Products

By NATHAN C. ROCKWOOD

**American Society for Testing Materials Convention at Chicago reports on various tests**

As USUAL, the annual meeting of the American Society for Testing Materials (Chicago, Ill., June 23-27) had much of interest and value to producers and manufacturers of rock products. While relatively few producers, other than the technical men in the cement industry, attend these meetings, many more could do so with profit. Our own report is confined to cement, lime, gypsum, aggregates, mortar and concrete, but other parts of the proceedings such as that on corrosion of iron and steel are helpful to our industry.

### Cement

The report of Committee C-1 on Cement recommended that the Tentative Specification for Portland Cement (C150-40T) adopted a year ago, with some slight changes, be adopted immediately as Standard, to replace the present Standards (C9-38) and (C74-39) for portland cement and high early strength portland cement. This will be done by letter ballot of the Society in the near future.

The revisions of the Tentative Specification as published in ROCK PRODUCTS, August, 1940, are in the definition of Type II cement, which now reads: "For use in general concrete construction exposed to moderate sulfate action, or where moderate heat of hydration is required." This is a little more comprehensive than the previous definition and apparently is evidence of the growing popularity of Type II as an all-purpose cement. The other change is in the definition of portland cement, in the part pertaining to additions subsequent to calcination, which was revised to read: " . . . except that other materials may be added provided that they have been shown to be acceptable, in the amounts indicated, by tests carried out or reviewed by Committee C-1." This is slightly more liberal than the original wording.

The committee reported it had given much thought to a number of proposed revisions, such as changes in strength requirements, chemical limitations, fineness, etc., but no changes were made in these. The table of chemical requirements was rearranged to put silicon dioxide first, aluminum oxide second, etc. Incidentally the chemical names of these constituents are used where silica, alumina, etc., were originally used.

Nothing appears in the revised specification on "permissible total alkalies" ($Na_2O$ and $K_2O$) although the committee reported a study of the subject. There is considerable confusion as to the meaning of "total alkali." This part of the report is as of much interest to aggregate producers as to cement manufacturers:

> Attention has been directed in various articles during the past few years to the possibility of the reaction of "alkali," set free in the hydration of cement, on certain minerals occurring in aggregate. In several cases in highway work in California and in the Parker Dam on the Colorado River the resulting action manifested itself either by "map cracking" on the surface, or by marked cracking extending to some depth in the concrete, or marked volume changes amounting to incipient disintegration. Although the alkali present to a major extent in the hydration of cement is lime (CaO), which doubtless does react with all but calcareous aggregate—and in so doing may not produce unfavorable results—the evidence advanced to date seems to place the fault with the $Na_2O$ and possibly also the $K_2O$ which is present in all cements. Although the total amounts of these oxides never exceed 1.5 percent—and may be as low as 0.10 per cent—and averages possibly for all cements approximately 0.75 percent, it appears that amounts of about 0.60 percent are sufficient to cause concern, particularly with rocks or minerals such as andesite, opaline-like silicas, possibly certain cherts and feldspars, indurated shale-like rocks, etc.
>
> As a result of the agitation on this question, the committee last year considered the need of limits for the $Na_2O$ and $K_2O$ before proposing the Tentative Specifications C 150 — 40 T. However, it is believed the question should be studied further. There was organized during the year a subcommittee to look into the matter, under the direction of R. F. Blanks. At the time of the last meeting of Committee C-1, this subcommittee was not able to advance any recommendations, and hence in the revision of Specifications C 150, submitted herewith for adoption as standard, there are no suggested limits for the two oxides in question. However, all of the members of the committee are mindful of the fact that this is one of the most important technical matters now before the cement industry and the subject will have the committee's marked attention.

Some revisions were made in Tentative Method of Test for Fineness of Portland Cement by Means of the Turbidimeter, mostly in making it more easily understood. The subcommittee on volume change and soundness reported that the laboratory of the U. S. Public Roads Administration is actively studying the autoclaving of clinker as proposed by Ira Paul, New York State Department of Public Roads. Clinker from 60 mills has been subjected to autoclaving and results compared with the expansion of neat cement bars, freezing and thawing tests, the Merriman sugar test, the usual acceptance tests of cement, etc.

### Lime

Committee C-7 on Lime reported increasing activity as a result of its reorganization a year ago. Summarizing this progress the chairman said: "The committee is hard at work on revision of specifications, and several of its members are engaged in research work through which it is hoped to answer some fundamental questions in regard to the constitution of lime, and the effect it has on the properties of lime. Until some of these questions are answered it will not be possible to write specifications very intelligently.

"I refer particularly to revision of standards for structural lime, which have been the chief target for criticism. Much of this criticism was caused by confusion of properties or lime characteristics desirable, undoubtedly, in hydrated finishing limes for white-coat plaster, but not necessarily in hydrated lime for mortar. To simplify the problem, Subcommittee II plans to establish two small working committees to prepare separate tentative specifications, one for finishing hydrate and one for mason's hydrate. I believe I am safe in saying that such tentative specifications will be ready for submission in 1942.

"The so-called new limes, including the nearly completely hydrated magnesium limes, are not simple products containing calcium and magnesium hydrates. We know from very recent research that they may contain more complicated magnesium hydrates, and under certain conditions, the trihydrate of magnesium carbonate. While such limes are more plastic, and practically free from unhydrated magnesia, neither manufacturers or users are yet familiar enough with their other properties, nor with control of manufacture, to feel that they are the final answer for all structural purposes. There may be a few people

who have all the answers; if so they have not given the committee the benefit of their knowledge. Under the circumstances, I do not feel that criticism of the committee for lack of speed in writing specifications is quite justified."

HOWARD R. STALEY, assistant professor of building construction, in charge of the building materials research laboratory, Massachusetts Institute of Technology, presented a paper on "Properties of Limes and Lime Mortar," in which he described the properties of seven hydrated limes in both paste form and when incorporated into mortars. His conclusions were:

"Hydrated limes may be roughly classified as regards their plasticizing ability in a mortar, by an examination of the mixing-water requirements for a mortar of fixed sand-content and consistency. Six of the seven limes investigated could be classified on the premise of the higher the mixing-water requirement, the higher the plasticizing ability.

"Relative sand-carrying capacities of the lime-hydrates were measured most accurately with the extrusion-device. The void-method presented checked the extrusion device most consistently.

"No apparent relation was found between plasticity-figure and flow-after-suction, or between plasticity-figure and sand-carrying capacity.

"A rough relationship was shown between flow-after-suction and sand-carrying-capacity.

"Hydrated limes may be roughly classified as to their plasticizing ability in a mortar by sedimentation tests and the determination of the immobile-water factor.

"A rough relationship is shown between the immobile-water factor and flow-after-suction. No apparent relationship is shown between the immobile-water factor and plasticity."

### Gypsum

Committee C-11 on Gypsum revised specifications for Structural Gypsum Products and for Gypsum Partition Tile to conform to new Federal Government Specifications, and recommended the revised specifications for adoption as Standard. This committee apparently takes a much easier route to revision of specifications than Committees C-1 and C-7, whose members frequently question the wisdom of Federal Government specification writers.

The report of Committee C-11 says, naively: "The committee has been considering the revision of these specifications for several years because of several obsolete sections in the specification, but since the Federal Specifications Board was engaged in the preparation of a federal specification for gypsum partition tile, action was withheld until the federal specification was approved. This specification has now been promulgated, and Committee C-11 has revised the Standard Specifications for Gypsum Partition Tile or Block (C 52-33) so that they are in agreement with the Federal Specification for Gypsum Partition Tile (SS-T-316)."

### Masonry Mortars

Committee C-12 on Mortars for Unit Masonry presented a report including proposed Tentative Specifications for Mortar for Reinforced Brick Masonry, a distinguishing feature of which is an attempt to write a new specification for lime as follows:

> **(b) Hydrated Lime.** — Hydrated lime shall conform to either of the two following requirements:
>
> (1) The total free (unhydrated) calcium oxide (CaO) and magnesium oxide (MgO) shall be not more than 8 percent by weight (calculated on the as-received basis for hydrates).
>
> (2) When the hydrated lime is mixed with portland cement in the proportion specified in Section 9 (a), the mixture shall give an autoclave expansion of not more than 0.50 percent when tested in accordance with the Tentative Method of Test for Autoclave Expansion of Portland Cement (A.S.T.M. Designation: C 151) of the American Society for Testing Materials.
>
> Hydrated lime intended for use when mixed dry with other mortar ingredients shall have a plasticity figure of not less than 200 when tested 15 min. after adding water. The test otherwise shall be made in accordance with Sections 7 to 10, inclusive, of the Tentative Methods of Physical Testing of Quicklime and Hydrated Lime (A.S.T.M. Designation: C 110) of the American Society for Testing Materials.
>
> **(c) Lime Putty.** — Lime putty made from either quicklime or hydrated lime shall be soaked for a period sufficient to produce a plasticity figure of not less than 200 and shall conform to either the requirements for limitation on combined oxides of calcium and magnesium or the autoclave test specified for hydrated lime in Section 8 (b).

The authority of Committee C-12 to write a specification for lime will undoubtedly be questioned—particularly a specification which it is said could not be filled except by a very few manufacturers at the present time.

### Durability of Mortars

C. A. HUGHES and KENNETH A. ANDERSEN, associate professor of structural engineering, and research assistant, respectively, University of Minnesota, in a paper: "The Effect of Fine Aggregate on the Durability of Mortars," concluded: "The positive evidence from the investigation is that aggregates of either low absorption and low loss, or of high absorption and high loss, in the magnesium sulfate test result in mortars of low resistance to natural weathering and to the slower laboratory freezing-and-thawing cycle. In other words, aggregates having an intermediate magnesium sulfate loss (about 20 percent for the aggregates and water-cement ratios of this investigation) may be expected to produce mortars of high resistance to freezing and thawing.

"On the negative side, the compressive strength is shown to have no relation to the resistance to natural weathering, or to the slow cycle of laboratory freezing and thawing, when different aggregates and water-cement ratios of 5.07 and 6.76 gal. per sack are used. Also no relation between the laboratory cycles on the mortars and natural weathering was developed which would permit the use of either laboratory cycle as a control test for durability.

"As a result of this and other investigations, the authors have become convinced that slow laboratory cycles are preferable to fast cycles and that until the differences between data from different freezing cycles, shapes and sizes of specimens, and criterion of resistance are explained, little progress will be made in developing durability control tests."

### Ready-Mixed Concrete

Committee C-9 on Concrete and Concrete Aggregates reported new Tentative Specifications for Ready-Mixed Concrete, which take into account developments since the present Standard Specifications (C94-38) were written. These, however, will continue as Standard until the new Tentative, or revision thereof, replace the Standard. Copies of the new Tentative Specification (C94-41T) may be obtained from the Society. They permit 1½-hr. of haul (longer times up to 3 hr. are said to be safe under certain conditions). The new specifications are clearly and simply worded and should prove very helpful in promoting good practice.

### Concrete Aggregates

Four sections of a "Revised Report on Significance of Tests of Concrete and Concrete Aggregates" were presented. They were: "Significance of Tests for Size, Shape, Surface Texture, and Grading of Aggregates," by H. J. GILKEY, Iowa State College; "Density and Unit Weight of Concrete," by M. A. SWAYZE, Lone Star Cement Co.; "Mineral Composition of Aggregates," HERBERT F. KRIEGE, The France Stone Co.; "Significance of Permeability and Absorption of Concrete," by M. O. WITHEY, University of Wisconsin.

# NEW MACHINERY * NEW EQUIPMENT

## Arm-type Hydraulic Hoists for Dump Bodies

GAR WOOD INDUSTRIES, INC., Detroit, Mich., is now in production of several arm-type hydraulic hoist models which have been designed for installation on 1½- to 2-ton truck chasses.

Arm-type hoist designed to place minimum stress on body and hinges

They are said to be especially adaptable for use in connection with dump bodies from 8 to 10 ft. in length. Three sizes are being manufactured which have been designated D6R, D7R and D7LR.

It is claimed that the lifting effort is reduced considerably, due to the body being lifted farther forward than with the older type units. The lifting effort, which is distributed over a greater area, is confined within the self-contained assembly of the hoist unit.

## Simple Particle Size Apparatus

PALO-MYERS, INC., New York City, has placed on the market a particle size analyzer developed by Pierce M. Travis, which is so simple in operation and low in price that it should find wide application in the rock products industries for determining particle size distribution in the micron-size field. It is a sedimentation apparatus and it is claimed will determine particle size down to 2 microns.

A 2½-gram sample is used. The sample is first wetted with some suitable liquid in which the material is insoluble. Then as a paste or properly thinned the sample is put into the sample reservoir, or mixing chamber, which is separated from the 100 centimeter settling tube by a stop cock.

At the bottom of the tube, the sedimentation measuring tube, which has a flat bottom and graduations in millimeters, is supported by an interchangeable ground glass stopper. A micrometer eye piece, mounted to the left of the sedimentation measuring tube permits reading to fractions of a millimeter. To the right of the sedimentation measuring tube is an electric lamp so placed that the reading is made easy. An electric stop clock is supplied for apparatus using 110-v. 60-cycle current. Beside the

Particle size analyzer of the sedimentation type

lamp is an electrically operated tapper to keep the sediment column level.

The time of settling and the depth of the sediment is measured. After all readings have been made, the radius in particle size in microns can be determined by applying the following formula:

$$r = \sqrt{\frac{9}{2} \frac{N \; Vo}{(d_1 - d_2)\; g}} \times 1000$$

$r$ = radius of particle in microns.

$N$ = specific viscosity of medium as compared to water.

$Vo$ = rate of sedimentation which is the height of fall in centimeters divided by the time in seconds.

$d_1$ = density of particle.

$d_2$ = density of medium.

$g$ = the acceleration due to gravity, which is 980 dynes in most places.

Hence by equation, the radius of the particles is calculated and then the value of $r$ multiplied by 2 represents the diameter of the particles in microns. One micron equals 0.001mm. Where one substance is to be run often, a curve can be plotted using radius against time, and particle size read direct.

The price of the standard apparatus is $115.

## Pyrometer for Automatic Kiln Control

THE BROWN INSTRUMENT CO., Philadelphia, Penn., has designed what is known as the Radiamatic pyrometer which has been installed on a number of cement plant kilns as a means of automatic control.

In operation, the detector of the pyrometer is focused through a hole in the firing hood upon the kiln lining in the hot zone, and a continuous record of kiln temperatures is recorded on a Brown recording potentiometer on the control panel. Kiln speeds and the rate of feed of raw material into the kiln are held constant. Burning conditions inside the kilns are stabilized constantly by adjustment of coal feed only.

The Radiamatic pyrometer consists essentially of a heat-resisting lens, a compensator and a thermopile. The heat radiated from the hot zone falls on the lens and is focused on the thermopile which generates an e.m.f. proportional to the true temperature. The compensator corrects for ambient temperature fluctuations

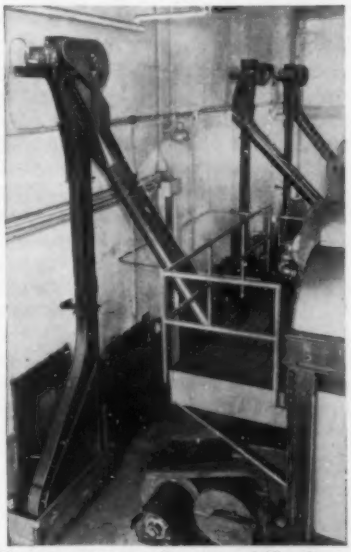
Pyrometer which is used in connection with a potentiometer to give a continuous record of cement kiln temperatures

## Bulk Conveying System

LINK-BELT CO., Chicago, Ill., has developed what has been termed a Bulk-Flo conveying system for the positive and continuous conveying of flowable and granular, crushed, ground or pulverized materials of a non-corrosive, and non-abrasive nature. Capacities range from one to 140 tons per hour.

The conveying medium employs a specially designed chain, usually made of malleable iron, to which solid peak-top flights are rigidly attached at every pitch. These divide the material in the conveyor duct into a continuous series of batches, which are moved positively by the peak-top flights, whether there be full load or only a partial load.

These units may follow almost any desired pitch—horizontal, inclined,

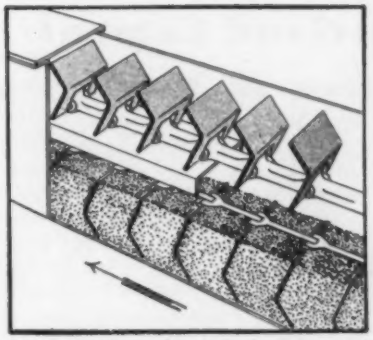


**Three conveyor-elevators following a loop path, feeding coal to stokers**

vertical or curvilinear, and a single self-contained unit may carry in all these directions in the same vertical plane. They may be fed or loaded at various points to suit conditions. Feed and discharge openings, also openings for inspection and access, are readily provided in the conveyor casing.

It is said that one of these installations requires only approximately one-fifth the cross section of a bucket elevator of corresponding capacity, one-third that of a belt conveyor, and about one-fourth the cross section of a flight conveyor. This is due to the fact that material moved occupies the maximum cross-sectional area of the conveyor duct. Another feature of this type of conveyor is that it completely discharges.

This type of conveyor is adaptable to the conveying of cement, finely



**Cross section showing how peaked flights move the material**

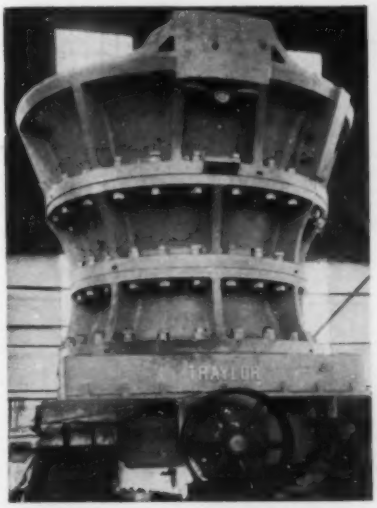
ground rock, ground silica, limestone dust, powdered coal and other materials handled in the rock products industries.

## Largest Gyratory Crusher

TRAYLOR ENGINEERING & MANUFACTURING CO., Allentown, Penn., has built what is believed to be the heaviest crushing machine ever constructed for use as a primary breaker at the new Morenci, Ariz., plant of Phelps Dodge Corporation. This 60-in. Bulldog gyratory crusher, shown in the illustration, is one of the very few of this size that have ever been built.

It was designed to handle the primary crushing of the 25,000-ton per day reduction and concentrating plant, handling 1.06 percent copper ore, but the crusher is large enough to take care of a 40,000-ton plant.

The crusher will operate at a rate of about 1600 tons hourly, day in and day out, to a size receivable by secondary reduction crushers, which will prepare the ore for ball mills that will grind it to concentration fineness for processing.



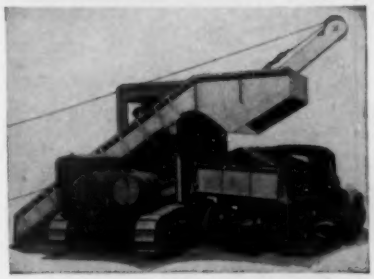

**Giant crusher which will handle 1600 tons hourly**

It is built of cast steel throughout, with the exception of the forged steel shafts and manganese steel crushing head and concaves. The metal in the several sections is from 6 to 8 in. thick, and the total weight is about 1,000,000 lb.

A circulating lubrication system, using 1000 gal. of oil, is employed, and the cooling of this oil requires about 100 g.p.m. of water.

## Scraper-Loader

SAUERMAN BROS., INC., Chicago, Ill., has designed a new crawler-mounted scraper-loader with a large hydrauli-



**Above: Front view of 1-cu. yd. scraper-loader, Diesel model, loading material into truck. Below: Rear view of this novel equipment**

cally controlled "teetering" ramp.

The machine is equipped with a 1-cu. yd. Crescent scraper bucket, to which is attached drag cables 400 ft. long. Operating the scraper bucket is a power unit, comprising a double-drum hoist driven by either a 60-hp. gasoline or Diesel engine or by a 40-hp. electric motor. Power is furnished to the crawlers from a take-off on the hoist.

In handling loose material from a pit, bank or stockpile 400 ft. wide, this machine will load an average of eight 5-ton trucks per hour, assuming that the bucket is so operated as to maintain an average length of haul of about 200 ft. Any reduction in haul brings a proportionate increase in hourly capacity. When moving around a job or to a new location, the front of the "teetering" ramp is raised from the ground and held in place by hydraulic rams. Travel speed, throttle-controlled, is 88 f.p.m.

# Facts About Portland Cement Statistics and Prices of Varieties

PRODUCTION OF PORTLAND CEMENT in 1940 — 130,216,511 bbl. — the largest quantity manufactured since 1930—showed an increase of 7 percent from 1939, but a decrease of 26 percent from 1928, the highest year of production.

Shipments of portland cement from mills in 1940—130,349,786 bbl.—increased 6 percent in quantity and 4 percent in gross value—$188,078,068. The average factory price per barrel in bulk in 1940 was $1.44, a decrease of 3c per bbl. as compared with 1939.

TABLE 1—PORTLAND CEMENT PRODUCED AND SHIPPED IN THE UNITED STATES AND PUERTO RICO IN 1940

| District | Active plants | Production: Barrels | Production: Increase or decrease in 1940 over 1939 (percent) | Shipments: Barrels | Shipments: Value | Shipments: Average factory value | Shipments: Increase or decrease in quantity, in 1940 (percent) |
|---|---|---|---|---|---|---|---|
| East. Pa., N. J. & Md. | 22 | 24,970,132 | +6 | 25,497,435 | $35,525,165 | $1.39 | +8 |
| N. Y. & Maine | 12 | 8,784,509 | +20 | 8,613,535 | 12,305,493 | 1.43 | +18 |
| Ohio, West. Pa., and W. Va. | 18 | 13,374,846 | +18 | 13,641,016 | 18,425,279 | 1.35 | +18 |
| Michigan | 9 | 8,603,188 | +5 | 8,519,416 | 11,389,191 | 1.34 | +2 |
| Wis., Ill., Ind. and Kentucky | 11 | 12,663,788 | +3 | 12,735,763 | 17,158,407 | 1.35 | +5 |
| Va., Tenn., Ala., Ga., La., & Fla. | 18 | 14,710,971 | +10 | 14,852,453 | 22,473,321 | 1.51 | +10 |
| East. Mo., Iowa, Minn. & S. Dak. | 11 | 10,304,229 | —2 | 10,170,536 | 16,540,187 | 1.63 | —2 |
| West. Mo., Neb., Kans., Okla. & Ark. | 12 | 7,597,759 | —5 | 7,614,858 | 11,527,579 | 1.51 | —5 |
| Texas | 10 | 7,374,886 | +1 | 7,383,600 | 12,198,800 | 1.65 | +2 |
| Colo., Mont., Utah, Wyo. & Idaho | 8 | 2,961,823 | —3 | 2,951,094 | 5,420,245 | 1.84 | —4 |
| California | 11 | 14,215,745 | +29 | 13,813,362 | 17,296,522 | 1.25 | +22 |
| Oregon & Wash. | 9 | 4,268,811 | +27 | 4,172,476 | 7,188,003 | 1.72 | —31 |
| Puerto Rico | 1 | 385,824 | +19 | 384,242 | 629,876 | 1.64 | +10 |
| | 152 | 130,216,511 | +7 | 130,349,786 | 188,078,068 | 1.44 | +6 |

Table 1 gives a summary of production, shipments and net mill prices, by producing district.

Table 2 gives the method of shipment in 1936, 1939, 1940. These data show that 80.9 percent of the mill shipments in 1940 were moved by railroad; 15.6 percent by truck and 2.2 percent by boat; (for the remaining 1.3 percent, the carrier was not stated); 25.6 percent of the shipments was in bulk; 42.4 percent in paper bags; 31.9 percent in cloth bags; 0.1 percent in other containers.

From monthly estimates of the cement producers, supplemented by a few estimates by the Bureau of Mines, Table 3 gives detailed data on fuels used in 1940 at portland cement plants in the United States (including Puerto Rico) in making 130,141,000 bbl. of clinker (unground cement) and 130,216,511 bbl. of finished cement.

From reports of the producers the electricity used in the industry in 1940 totaled 2,971,328,181 kw.h., of which 51.0 percent was purchased and 49.0 percent generated at the plants. At 27 plants in 1940 all the power used was generated at the plant.

The total manufacturing capacity of the 152 plants active at the end of 1940, and of 8 plants idle in 1940, but producing or shipping from stock within the 7 previous years, was 254,145,000 bbl., according to manufacturers' reports supplemented by a

TABLE 2—SHIPMENTS OF PORTLAND CEMENT FROM MILLS IN BULK AND IN CONTAINERS, BY TYPES OF CARRIERS
(Unit of measure, barrels of 376 lb.)

| Type of carrier | In bulk | | In containers: In bags: Paper | In containers: In bags: Cloth | In containers: In other containers[1] | In containers: Total in containers | Mode of shipping not stated | Total shipments | |
|---|---|---|---|---|---|---|---|---|---|
| 1936 | | | | | | | | | |
| Truck | 793,550[2] | 3.9 | 4,090,942 | 5,023,665 | ..... | 9,114,607 | ..... | 9,908,157 | 8.8 |
| Railroad | 17,071,517 | 84.3 | 36,728,613 | 30,107,645 | 4,006 | 66,840,264 | 725,809 | 84,637,590 | 75.0 |
| Boat | 165,820 | .8 | 753,838 | 496,151 | 17,693 | 1,267,682 | ..... | 1,433,502 | 1.3 |
| Not stated | 2,226,828 | 11.0 | 2,937,472 | 3,615,491 | 9,743 | 6,562,706 | 8,081,196 | 16,870,730[3] | 14.9 |
| | 20,257,715 | 100.0 | 44,510,865 | 39,242,952 | 31,442 | 83,785,259 | 8,807,005 | 112,849,979 | 100.0 |
| Percent of total shipments | 18.0 | .... | 39.4 | 34.8 | ..... | 74.2 | 7.8 | 100.0 | .... |
| 1939 | | | | | | | | | |
| Truck | 2,078,494[2] | 8.6 | 7,325,535[4] | 6,913,700 | 140,904 | 14,380,139[4] | ..... | 16,458,633[4] | 13.4 |
| Railroad | 21,255,557 | 87.9 | 43,327,220[4] | 33,360,063 | 34,220 | 76,721,503[4] | ..... | 97,977,060[4] | 79.9 |
| Boat | 600,446 | 2.5 | 1,302,465 | 631,450 | ..... | 1,933,915 | ..... | 2,534,361 | 2.1 |
| Not stated | 250,594 | 1.0 | 439,221 | 498,273 | ..... | 937,494 | 4,493,317 | 5,681,405[3] | 4.6 |
| | 24,185,091 | 100.0 | 52,394,441[4] | 41,403,486 | 175,124 | 93,973,051[4] | 4,493,317 | 122,651,459[4] | 100.0 |
| Percent of total shipments | 19.7 | .... | 42.7 | 33.8 | 0.1 | 76.6 | 3.7 | 100.0 | .... |
| 1940 | | | | | | | | | |
| Truck | 3,873,114[2] | 11.6 | 8,308,058[4] | 8,095,980 | ..... | 16,404,038[4] | ..... | 20,277,152[4] | 15.6 |
| Railroad | 27,943,536 | 83.8 | 45,314,998[4] | 32,216,407 | 23,527 | 77,554,932[4] | ..... | 105,498,468[4] | 80.9 |
| Boat | 614,471 | 1.8 | 1,319,683 | 913,370 | ..... | 2,233,053 | ..... | 2,847,524 | 2.2 |
| Not stated | 934,281[5] | 2.8 | 427,323 | 365,045 | ..... | 792,368 | ..... | 1,726,649 | 1.3 |
| | 33,365,402 | 100.0 | 55,370,062[4] | 41,590,802 | 23,527 | 96,984,391[4] | ..... | 130,349,793[4] | 100.0 |
| Percent of total shipments | 25.6 | .... | 42.4 | 31.9 | 0.1 | 74.4 | ..... | 100.0 | .... |

[1] Includes steel drums and iron and wooden barrels.
[2] Includes cement used at mills by producers as follows: 1936, 103,893 barrels; 1939, 132,238 barrels; 1940, 118,710 barrels.
[3] Includes cement for which mode of shipping is not stated as follows: 1936, 8,081,196 barrels; 1939, 4,493,317 barrels.
[4] Includes Puerto Rico.
[5] Includes shipments by pipe-line.

few estimates. There were no new plants reported as entering production in 1940. The capacity of one plant, idle for ten years, has been excluded from the figures for 1940, while the capacity of another, which renewed production in 1940, was included. The total production for the year 1940 was 51.2 percent of the indicated capacity at the close of the year; the corresponding figure for 1939 from the producers' reports was 47.7 percent.

The only place where 100 percent of capacity was utilized is Puerto Rico. The nearest competitor was Texas with 60 percent capacity utilized. Of the output in 1940, 52 percent was made by wet process and 48 percent by dry process.

### Special Portland Cements

HIGH EARLY STRENGTH: Production of this variety in the United States in 1940, totaled 4,471,297 bbl. and shipments from the mills 4,401,274 bbl. valued at $8,241,879, an average of $1.87 per bbl. These figures represent the output of 88 plants located as follows: One each in Georgia, Kentucky, Louisiana, Maine, Maryland, Montana, Nebraska, New Jersey, Oklahoma, West Virginia, and Wyoming; two each in Colorado, Idaho, Illinois, Missouri, Oregon, Tennessee, and Virginia; three in Alabama; four each in Indiana, Iowa, Kansas, and Washington; five each in Michigan and New York; six in Ohio; eight in California; nine in Texas; and eleven in Pennsylvania. Corresponding data for 1939, which represent the output of 79 plants in 27 states, are: Production, 3,780,716 bbl.; shipments, 3,693,460 bbl. valued at $6,964,608, an average of $1.89 per bbl.

MASONRY PORTLAND CEMENT: Production in 1940, as reported by producers for 5 plants, totaled 219,480 bbl. and shipments from the mills 214,303 bbl. valued at $308,333, an average of $1.44 per bbl. Corresponding data for 1939, representing the output of 5 plants, are: Production 173,737 bbl. and shipments from the mills 155,781 bbl. valued at $211,711, an average of $1.36 per bbl.

**Average prices of special portland cements during 1940 as computed by the Bureau of Mines**

OTHER MASONRY CEMENTS: These statistics are *not* included in the accompanying tables for portland cement, although some of them involve the use of some portland cement, or portland cement clinker in their manufacture. These cements are sold under proprietary names and in various units of measure.

Production which was reported from 49 plants in 1940 totaled 2,312,155 bbl. and shipments 2,260,636 bbl. valued at $3,175,088, an average of

TABLE 3—PORTLAND CEMENT PRODUCED IN THE UNITED STATES AND PUERTO RICO, 1940, BY KINDS OF FUEL

| Fuel | Finished cement produced | | | Fuel consumed[1] | | |
|---|---|---|---|---|---|---|
| | Number of plants | Barrels of 376 pounds | Percent of total | Coal (short tons) | Oil (barrels of 42 gallons) | Natural gas (cubic feet) |
| Coal | 99 | 83,864,320[2] | 64.4 | 5,009,265 | ..... | ..... |
| Oil | 11 | 9,426,674[2] | 7.2 | ..... | 2,049,203 | ..... |
| Natural gas | 15 | 11,758,348[2] | 9.0 | ..... | ..... | 18,350,001,017 |
| Coal and oil | 5 | 6,765,481 | 5.2 | 410,278 | 230,446 | ..... |
| Coal and natural gas[7] | 15 | 11,384,238 | 8.8 | 211,015 | ..... | 14,125,049,790 |
| Oil and natural gas | 4 | 7,017,450 | 5.4 | ..... | 112,305 | 7,017,663,200 |
| Coal, oil, and natural gas | 3 | | | 2,598 | 33,022 | 2,455,985,000 |
| | 152 | 130,216,511 | 100.0 | 5,633,156[6] | 2,424,976 | 41,948,699,007 |

[1] Figures compiled from monthly estimates of the producers.
[2] In addition to the coal shown for this group 1 plant reported the use of petroleum coke with coal.
[3] Average consumption of fuel per barrel of cement produced was as follows: 1939—coal, 120.4 pounds; oil, 0.2248 barrel; natural gas, 1,529 cubic feet. 1940—coal, 119.5 pounds; oil, 0.2174 barrel; natural gas, 1,561 cubic feet.
[4] In addition to the coal, oil, and natural gas included for this group 1 plant reported the use of petroleum coke with coal, oil, and natural gas.
[5] Includes 79,839 short tons of anthracite and 5,194,624 short tons of bituminous coal.
[6] Revised figures.
[7] In addition to the coal and natural gas included for this group 1 plant reported the use of petroleum coke with coal and natural gas.
[8] Includes 74,437 short tons of anthracite and 5,558,719 short tons of bituminous coal.

TABLE 4—ELECTRICAL ENERGY USED AT PORTLAND CEMENT PLANTS IN THE UNITED STATES AND PUERTO RICO, 1940, BY PROCESSES, IN KILOWATT-HOURS

| Process | Electrical energy used | | | | | | Finished cement produced | Average electrical energy per barrel of cement produced |
|---|---|---|---|---|---|---|---|---|
| | Generated at portland cement plants | | Purchased | | Total | | | |
| | Active plants | Kilowatt-hours | Active plants | Kilowatt-hours | Kilowatt-hours | Percent | Barrels | Kilowatt-hours |
| Wet | 33 | 569,045,020 | 72 | 970,439,295 | 1,539,484,315 | 51.8 | 67,689,498 | 22.7 |
| Dry | 36 | 887,343,326 | 52 | 544,500,540 | 1,431,843,866 | 48.2 | 62,527,013 | 22.9 |
| | 69 | 1,456,388,346 | 124 | 1,514,939,835 | 2,971,328,181 | 100.0 | 130,216,511 | 22.8 |
| Percent of total electrical energy used | .. | 49.9 | ... | 51.0 | 100.0 | .... | ..... | .... |

$1.40 per bbl. Corresponding data for 1939, representing the output of 33 plants, are: Production 1,765,170 bbl. and shipments 1,754,887 bbl. valued at $2,362,885, an average of $1.35 per bbl. The output reported sold ordinarily in 256 to 380-lb. barrels is here expressed in terms of 376-lb. barrels to correspond with the figures of portland cement.

LOW- AND MODERATE-HEAT-OF-HARDENING: Low- and moderate-heat of hydration cement, including Tennessee Valley Authority Type B portland cement, produced in 1940, totaled 8,422,707 bbl. and shipments from the mills 7,584,047 bbl. valued at $10,136,101, an average of $1.34 per bbl. These figures represent the output of 55 plants. Corresponding data for 1939, which represent the output of 43 plants, are: Production 5,564,921 bbl., shipments from the mills 5,761,840 bbl. valued at $8,237,440, an average of $1.43 per bbl.

PORTLAND-PUZZOLAN CEMENT: At 10 plants in 1940 this type totaled 413,870 bbl. and shipments from the mills 412,143 bbl. valued at $552,830, an average of $1.34 per bbl. Corresponding data for 1939, are: Production 337,187 bbl., shipments from the mills 321,217 bbl. valued at $434,281, an average of $1.35 per bbl. Represents output of 9 plants.

OIL-WELL PORTLAND CEMENT: Twenty-two plants reported production in 1940 of 711,348 bbl. and shipments of this variety amounted to 719,022 bbl. valued at $1,365,840, an average of $1.90 per bbl. Corresponding data for 1939 for 12 plants, are: Production 375,866 bbl., shipments 375,027 bbl. valued at $710,032, an average of $1.89 per bbl.

SULPHATE-RESISTING PORTLAND CEMENT: Production in 1940, as reported by producers for 11 plants, totaled 193,348 bbl. and shipments from the mills 200,090 bbl. valued at $316,280, an average of $1.58 per bbl. Corresponding data for 1939, representing the output of 4 plants, are: Production 38,279 bbl., shipments 27,362 bbl. valued at $57,867, an average of $2.11 per bbl.

MISCELLANEOUS PORTLAND CEMENTS: Miscellaneous special portland cements produced in 1940, totaled 580,502 bbl., shipments from the mills 577,579 bbl. valued at $755,764, an average of $1.31. These figures represent the output of 14 plants. Corresponding data for 1939, which represent the output of 15 plants, are: Production 755,833 bbl., shipments 775,179 bbl. valued at $1,067,699, an average of $1.38 per bbl. These totals include certain plastic cements, etc.

# Priority Granted for Repair, Maintenance in 26 Industries

PRIORITY STATUS for repair and maintenance materials and equipment required for uninterrupted operation of a wide range of industrial processes and public services was assured when the Civilian Supply Allocation Division of the Office of Price Administration and Civilian Supply on July 1 promulgated an allocation program covering such items.

Action was necessitated by growing demands on raw materials as a result of the defense program and the priorities granted in connection therewith which have made it difficult for manufacturers of repair and maintenance materials and equipment to fill their orders. Effect will be to assure continued operation of essential industries and services which otherwise might have to curtail because of inability to secure needed repair or maintenance parts.

### 26 Industries and services Covered

The program covers 26 industries and services whose continued operation is essential to the public welfare and maintenance of civilian supplies. Other industries will be added when their problems have been analyzed. The program provides that such materials and equipment shall be allocated prior to all other civilian requirements and prior to defense requirements to the extent consistent with the defense program as determined by the Office of Production Management. Administration and enforcement of the program will be carried out by the OPM.

### From Rails to Parks

The program covers railroads; street railway, subway, elevated, and interurban lines; commercial airlines maintaining regular scheduled service; commercial operation of motor buses—local, interurban and interstate; shipping — including ocean, lake, river and canal commerce; pipe lines—oil and gas; commercial operation of motor trucks; highway maintenance; telephone communication; telegraph communication; radio commercial communication—including commercial broadcasting; electrical energy production and distribution; gas production and distribution—manufactured and natural; water production and distribution; sewer service; petroleum production and refining; food processing and storing; farm equipment employed in farming operations; mining and quarrying; coke converting; metallurgical plants engaged in the production of raw materials; production of chemicals; protective services — and academic; hospitals, clinics and fire and police; research—industrial sanatoria; public buildings, institutions, schools, and parks.

## U. S. Gysum Workers On Strike

UNITED STATES GYPSUM CO., Chicago, Ill., had 14 plants and two warehouses shut down on strike June 26. The strike was called by officials of the Gypsum Workers Organizing Committee, an affiliate of the United Mine Workers of America, C.I.O. A complete shutdown was claimed by the committee, involving more than 3500 workers and tieing up 75 percent of the company's production.

A spokesman for the company has announced that it is opposed to the plan of centralized bargaining for all its plants demanded by the CIO-United Mine Workers. Company states that system would be unfair to both its employes and the company, since its plants manufacture the products of eight separate industries in 42 locations.

The company pointed out that the National Labor Relations Board refused to designate the CIO as system bargaining agent for the plants and employes of the company in a decision of June 20. Present strike has been called at its 14 plants to force such system, the company claims.

### Less Than Half of Plants Affected

According to officials of the union, the plants affected are in Jersey City, N. J.; Fort Dodge, Iowa; East Chicago and South Bend, Ind.; Staten Island and Oakfield, N. Y.; Philadelphia, Penn.; Boston and Farnums, Mass.; South Gate, Calif.; Alabaster and River Rouge, Mich.; and Genoa and Gypsum, Ohio. Employes are also said to be on strike at warehouses in Harrison, N. J., and the Bronx, N. Y. Non-striking workers at the Oakfield plant have circulated a petition asking Governor Lehman to provide state police protection for those who wanted to work.

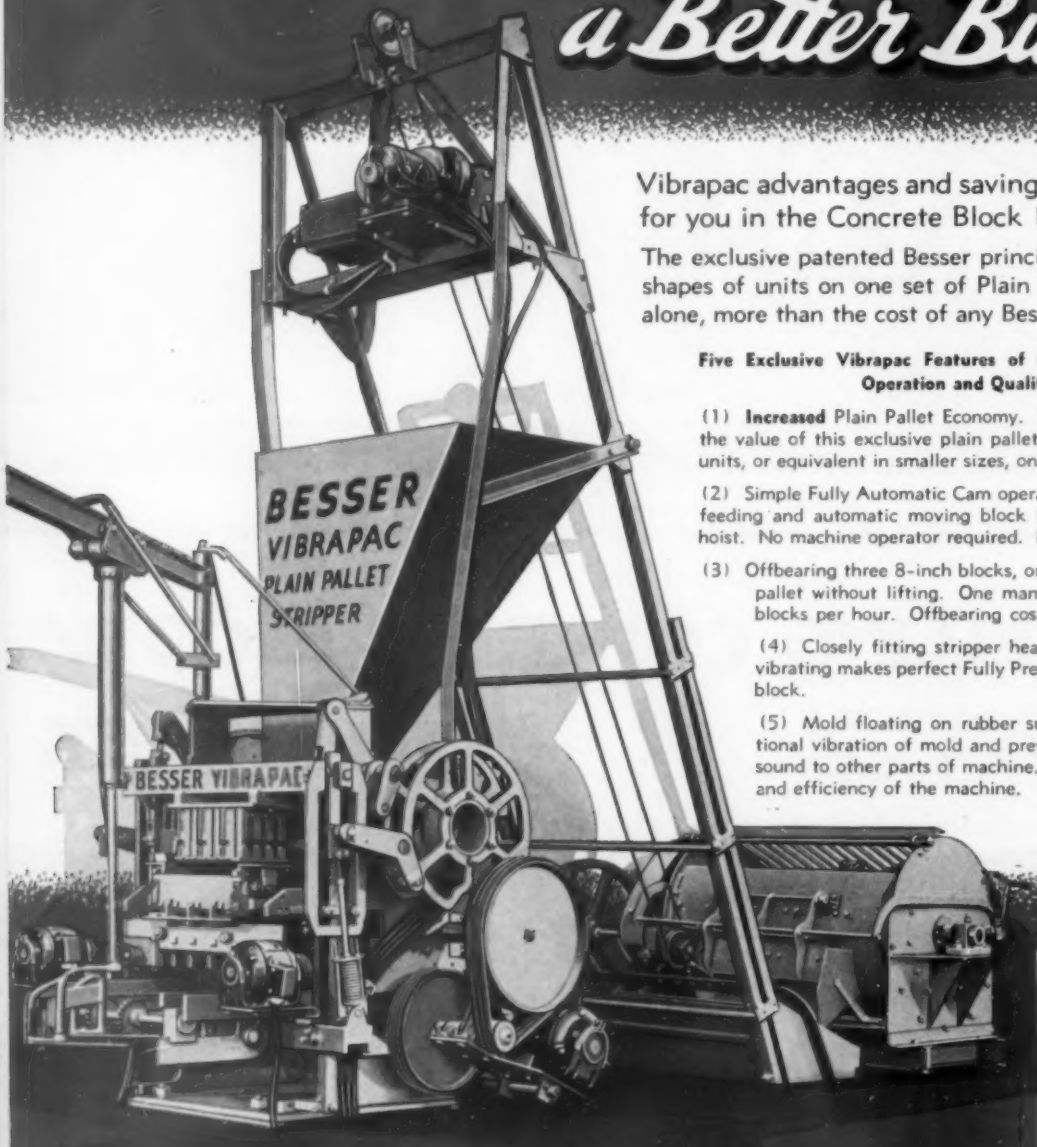
The company was granted an injunction to restrain pickets from interfering with those who wanted to work at the Oakfield plant.

# CONCRETE PRODUCTS AND CEMENT PRODUCTS

## SELLING CONCRETE FLOORS *by* EXHIBITS

Display of Elkan Stone Tile Mfg. Co., at the Macon, Ga., trade show sponsored by the Lions Club, showing local products

# Vibrapacs make Concrete Block Manufacturing a Better Business




Vibrapac advantages and savings insure greater success for you in the Concrete Block Industry.

The exclusive patented Besser principle of making all sizes and shapes of units on one set of Plain Pallets saves, in pallet cost alone, more than the cost of any Besser block machine.

**Five Exclusive Vibrapac Features of Great Importance in Economy of Operation and Quality of Product—**

(1) **Increased** Plain Pallet Economy. The Besser Vibrapac has increased the value of this exclusive plain pallet principle by making **three** 8 inch units, or equivalent in smaller sizes, on **one** plain pallet.

(2) Simple Fully Automatic Cam operated machine with automatic pallet feeding and automatic moving block forward for offbearing with power hoist. No machine operator required. Production 50% greater.

(3) Offbearing three 8-inch blocks, or equivalent, at a time on one plain pallet without lifting. One man guiding power hoist offbears 600 blocks per hour. Offbearing cost reduced two-thirds.

(4) Closely fitting stripper head pressing top of block with mold vibrating makes perfect Fully Pressed Top and perfectly dimensioned block.

(5) Mold floating on rubber supports cushions the free undirectional vibration of mold and prevents transmission of vibration and sound to other parts of machine. This insures maximum endurance and efficiency of the machine.

Besser Super Automatic Plain Pallet Vibrapac with Mixer and Skip Loader. Capacity: 600 8"x 8"x 16" per hour made 3 at a time on one plain pallet. Smaller units made in larger multiples on the same pallets.

Undirectional vibration under Flam patents (other patents pending) was employed to make the first vibrated blocks ever produced commercially. The Besser Vibrapac combines undirectional vibration with the exclusive Besser Plain Pallet principle. Users of these machines are fully protected under Besser and Flam patents.

## BESSER PLAIN PALLET STRIPPERS

**A Besser Plain Pallet Stripper For Every Need**

| | | |
|---|---|---|
| TAMPERS | Besser Super Automatic | 8 Hr. Capacity 3120 |
| | Besser Victory Automatic | 8 Hr. Capacity 2160 |
| | Besser Semi-Automatic | 8 Hr. Capacity 1680 |
| | Besser Champion, Power Operated, | 8 Hr. Capacity 1000 to 1200 |
| | Besser Multi-Mold, Hand Operated, | 8 Hr. Capacity 250 to 350 |
| VIBRATORS | Besser Super Automatic Vibrapac | 8 Hr. Capacity 4800 |
| | Besser Victory Automatic Vibrapac | 8 Hr. Capacity 2160 |
| | Besser Master Vibrapac, Hand Operated, | 8 Hr. Capacity 800 |

**BESSER MANUFACTURING CO. • ALPENA, MICH.**

100 FORTY-FIRST STREET

*Complete Equipment for Concrete Products Plants*

THE SAVING IN PALLET COST WILL PAY FOR A BESSER VIBRAPAC PLAIN PALLET STRIPPER

# Colored Tiles Sell Joists

**Entire floor construction sold through attractive colored tile and persistent merchandising program**

By BROR NORDBERG

Preparing joist forms before pouring concrete. Ten 20-ft. precast units are made at once

COLORED CONCRETE FLOORS of firesafe construction, recently introduced by the Elkan Stone Tile Manufacturing Co., Macon, Ga., are receiving an enthusiastic response from builders and architects in Georgia. Stonex floor tile and precast reinforced concrete joists are installed together to finish a 100 percent concrete floor in any desired color.

Elkan Stone Tile Manufacturing Co. started in the concrete products business 15 years ago manufacturing stone tile, and has been a prominent producer of cast stone since 1929.

### Trade Show and Advertising Bring Results

Stonex was added to the concern's line of products in October, 1940, under license from Stonex Industries, Inc., Miami, Fla., with exclusive manufacturing rights for the state of Georgia. Until April of this year, little effort was made to push Stonex, but the time was spent in equipping a modern addition to the plant and acquainting the workmen with its manufacture.

The first promotional efforts were made in April, 1941, when a newspaper advertising campaign was started in *The Macon Telegraph*. At that time, Macon held its first "Trade Show" under the sponsorship of the Lions Club, which afforded an opportunity to display the product and methods of manufacturing.

This trade show was planned to give Macon's local industries an opportunity to show their products every night for a week in the city auditorium. In the booth space, Stonex and the complete line of products were displayed including cast stone, ornamental concrete garden furniture and specialties. For the entire week, Elkan products were on display, as part of the show, in the windows of two leading downtown stores.

By taking advantage of these advertising opportunities, the company created a lot of interest and had first hand opportunity to answer questions and show how a new product with plenty of "eye appeal" was made and how it was applied in construction.

The first newspaper advertisement appeared that week, accompanied by plenty of free editorial support, at a time when the press was supporting the trade show. S. A. Elkan, president, reported a lot of inquiries locally, and from other cities in Georgia as a result of this first ad and accompanying publicity. He intends to carry on a consistent campaign, and is considering the establishment of agencies in cities outside of Macon.

The first sizable job of Stonex, now being built in Macon, is a new drive-in

Left: Mixing the batch and preparing the molds, vibrating table to the left. Center: Arthur Fowler, in charge of production, vibrating the facing layer. Right: Stripping floor tile on special machine. James Smith, plant superintendent, in center, and Arthur Fowler inspecting the surface

Stonex
AT LONG LAST—HERE IT IS
A NEW FLOOR AND WALL TILE
STONEX
by the makers of certified CAST-STONE
Like the well-known patent medicine—almost a cure all; Good for nearly everything.
Used with VIBRATED PRECAST CONCRETE FLOOR JOISTS, a fire proof, termite
proof, vermin proof, structural floor; Beautiful, sanitary, permanent.
Or in smaller sizes, as a finish for other floors and as a facing for walls, either inside
or out; For mantel facings, window stools, steps, porches and terraces. You must see
this beautiful new material to appreciate it.
We will be delighted to show you STONEX and tell you more about it.
ON EXHIBIT AT LION'S "SEE IT MADE EXPOSITION"
ELKAN Stone-Tile Mfg. Company
MANUFACTURERS OF STONEX PRODUCTS
AND QUALITY CAST STONE
Macon, Georgia
Phone 4269

**One of Elkan's newspaper ads calling the attention of the public to the exhibit of the company's products**

restaurant that will, when completed, be a fine advertisement in itself. All floors of the restaurant will have Stonex tile on precast concrete joists, and all the walls will have wainscotings of the same material. It represents 5000 sq. ft. of colored tile in 7000 individual pieces.

### Plant and Equipment

The Stonex plant is in a new 60- x 60-ft. addition to the main plant and the equipment is the type perfected by the parent company, using the same general standard manufacturing processes. Tile are manufactured in 6- x 6-, 6- x 12-, 12- x 12- and 24- x 24-in. sizes and have numerous applications.

The 24-in. size, a reinforced concrete load-bearing slab, is installed on joists spaced on 24-in. centers and with a grouted joint in place on the job. These are cast to a 2-in. thickness with a 4-in. square mesh of No. 12 spot welded wire for reinforcing. This slab may be cast with a colored face to produce a finished floor in colors, or plain, with the smaller tiles superimposed for other design effects. Small tile are ½- or ¾-in. thick without steel reinforcement, for placement over 24-in. plain slabs, or on other floors, or as wall tile and wainscoting. Other uses for Stonex tile are for risers, step treads and mantel facings, to mention a few.

Equipped to produce 300 sq. ft. of tile in 8 hr., the Elkan plant has a high frequency vibrating machine for placing the concrete, a machine to strip the molds, color mixing equipment and special curing racks. Colors are cast into the tile, using mineral oxides to produce any shades, tones and blends.

All the units are cast face down in special steel molds that have absorbent qualities, and the concrete is vibrated into place on the high frequency vibrating table. Procedure consists in first casting the facing with a minimum thickness of ⅜-in. with concrete having the desired colors, which are mixed in with a quartz sand and white or grey portland cement, according to whether the finished tile surface is to be light or dark in color. Mixes are comparatively dry with a consistency sufficient to prevent the aggregate breaking through the surface.

**Spacers cast to 2-ft. lengths in joist machine**

After the color mix has been vibrated into place, and allowed to stand about one hour, the backing of grey concrete is applied and vibrated into place to fill out the thickness of the tile. For backing, sand aggregate only is used in the mix for small tile. On the large tile, a ⅜-in. top size crushed granite is used in a mix of 1: 3: 4.

Molds are stripped two days after the tile is cast, on a special machine which "springs" the sides of the molds to release the tile. The vibrating table and the stripping machine are manufactured by The Kirk and Blum Manufacturing Co. All the tile are air cured inside the building and shipped only after proper curing has taken place.

Joists are the standard reinforced I-beam design cast up to 20 ft. in length, 10 at a time, on a Kirk and Blum vibrating table. Most of the joists manufactured have an 8-in. depth. A ⅜-in. maximum size granite and natural concrete sand are the aggregates used in manufacturing joists, with a 1: 3: 4 mix. Lengths are made to fit the job and spacers are cast to fill out the table in a run of joists. Spacers are standard length and are kept in stock.

The complete list of Elkan products consists of Stonex tile, concrete joists, cast stone, sills, cast stone trim, stepping stones and lawn furniture, such as benches, boxes, urns, bird baths, and other miscellaneous products, to keep the men busy.

S. A. Elkan is president of Elkan Stone Tile Manufacturing Co., and Eli Elkan is vice-president. James Smith is superintendent of the plant and Arthur Fowler is in charge of Stonex production. Mr. Fowler previously had been manufacturing the tile at the parent company in Miami, Florida.

## Washington Plants Busy On Defense Orders

Olympic Portland Cement Co., Bellingham, Wash., has orders for 150,000 bbl. of cement, all for defense work, which will keep the plant operating at about two-thirds of capacity through the summer months, according to A. F. Krabbe. About 80,000 bbl. will be shipped to Alaska for use in building airports and other defense work. The Superior Portland Cement Co., also is furnishing a large volume of cement for defense work.

# ABSOLUTELY, YOU CAN MAKE MORE MONEY with JAEGERS

CHARGE FASTER
MIX FASTER
DISCHARGE FASTER

EITHER
## HIGH DUMP
TYPE

Today's concrete production is going to Jaeger Truck Mixers, Agitators as fast as operators can expand their plants: (1) because the concrete industry has proof of the *higher quality* of material produced by the Jaeger Dual-Mix Drum; (2) because opportunities for comparison, on this year's gigantic projects, have proved beyond question that Jaegers, whether HIGH DUMP or Standard LOW CHARGE, can load, mix and discharge faster than any other mixers of their type.

Jaeger, alone, offers this higher payload production with standard 2-Speed Transmission (Separate Engine or Vacuum-Controlled Truck Engine Drive), One-Shot Top Loading, Vacuum-Controlled High Discharge Door, End-to-End Water Sprays and Mixing in Sealed Drums — *in the only line that completely meets every specification and operating demand.*

**Combination Top or End Loading with Jaeger Hopper Attachment:**

Specially adapted to older or temporary plants not equipped for fast ribbon loading. Permits top or end charging to meet conditions. Only end loader that does not constrict drum opening or require moving Hopper to discharge. Single turn of hand wheel opens Discharge Gate. No second seal to leak or wear.

OR
## LOW CHARGE

A DRUM-FULL
— OR A CUPFUL
— AT A TIME

### JAEGER PORTABLE HOPPER

Saves Truck Mixers Waiting—Means 25% More Payloads per Day on the Average Job.

Tows to job behind truck mixer —takes full 2 or 3 yd. batches. One hopper serves almost any job.

### THIS HANDY BLANK BRINGS YOU FULL INFORMATION:

Complete 1941 Data, Models, Specifications, Prices, Terms

**THE JAEGER MACHINE COMPANY**
603 Dublin Avenue, Columbus, Ohio

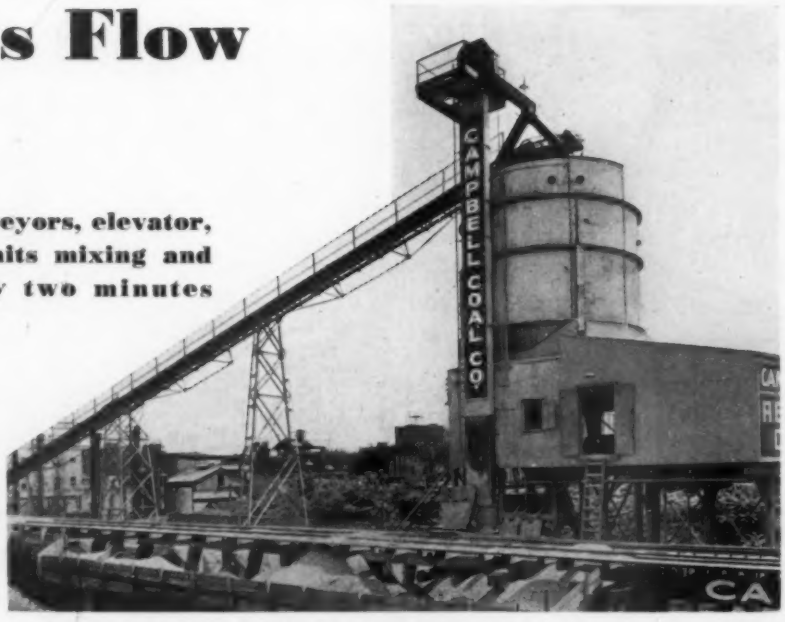
Send us newest information on ☐ Standard LOW CHARGE Truck Mixers, Agitators, ☐ HIGH DUMP Models, ☐ Portable Hoppers, ☐ Auto-Pavers and Spreaders, ☐ Pumps, ☐ Mixers, ☐ Hoists, ☐ Carts.

Name_____

Address_____

# Continuous Flow Batching

**Simplified system of conveyors, elevator, and batching plant permits mixing and loading 2 cu. yd. every two minutes**




**Long conveyor belt inclining up to the top of bins for movement of aggregates from bins alongside track. Elevator handles cement**

EARLY IN 1940 the Campbell Coal Co., Atlanta, Ga., built one of the most up-to-date ready mixed concrete plants in the South. This concern is a large building supply dealer, and has gone into the concrete business on a big scale, with a modern, all-steel batching plant and a fleet of 16 truck mixers.

Located not far from the business center of Atlanta, the plant adjoins the Southern Railroad, to receive aggregates and cement, either in bulk or in bags, by rail. Capacities for mixing materials are greater than are usual for ready-mixed concrete operations.

The concrete plant is of Blaw-Knox design, with an overhead batching bin that provides for four cars of aggregates and four cars of bulk cement. In addition to this capacity, bottom dump cars fill long bins directly below the siding, where there is additional storage for 25 cars of crushed granite and 12 cars of natural sand, which are reclaimable into the batching bins. Coarse aggregate sizes used are a 1-in., ¾-in. and ⅜-in. minus stone.

Under the "dead storage" bins is a continuous horizontal 24-in. belt conveyor, 240-ft. centers, on to which stone or sand is drawn from either bin for transfer to a similar 24-in. inclined belt which fills the steel bins. A swiveled discharge spout at the conveyor head pulley is set for filling either bin compartment.

These conveyors, together with the screw conveyors and enclosed bucket elevator, 60-ft. centers, which conveys and elevates bulk cement directly from cars into the bins, were furnished by the Link-Belt Co.

### Automatic Bin Level Control

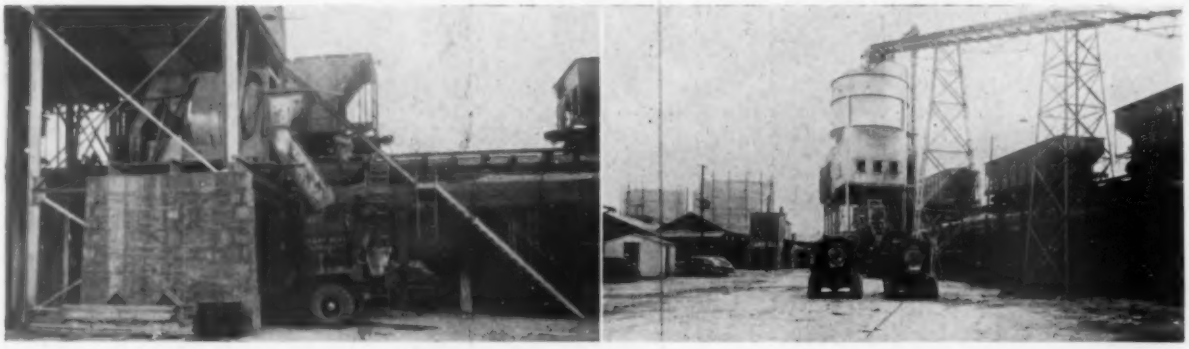
Normally cement is received in bulk, but additional capacity of about four cars is provided for by a warehouse adjoining the batching floor where sacked cement is stored. Sacked cement may be emptied through a special hopper directly into the screw conveyor feeding the bulk cement elevator.

Each bin compartment is fitted with a Bin-dicator which automatically rings a bell to indicate when the bins are approaching "full," when the conveyors, or elevator, are in operation. After the alarm sounds, there still is sufficient space inside the bins to accommodate the load of materials already in transit from aggregate bins, or from cars, in handling cement.

### Central Mixing

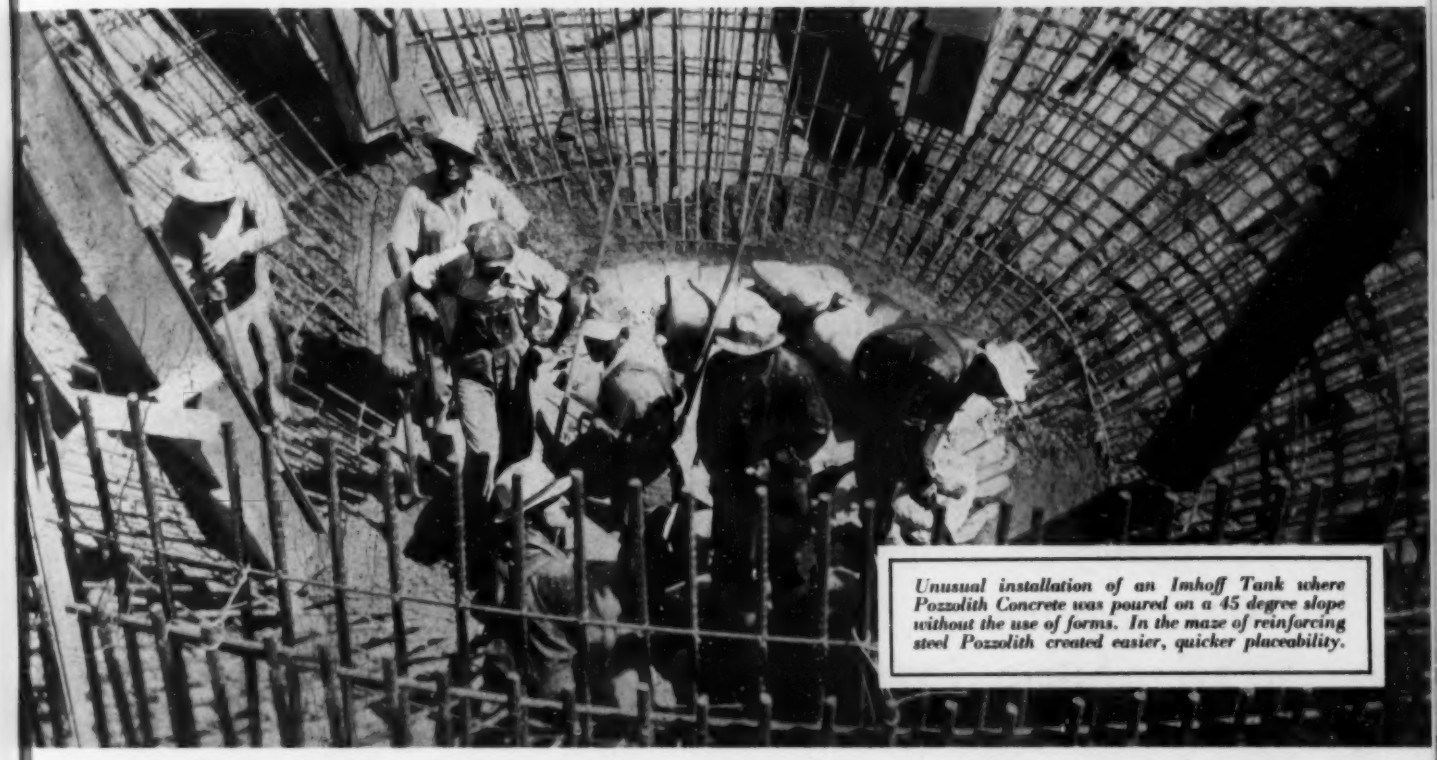
This plant is designed for central mixing which is the established practice in Atlanta, but has provisions for direct loading of batched materials into transit mixers for mixing in transit on long hauls. Batching equipment includes a Neptune water meter, a 2-cu. yd. Blaw-Knox weigh batcher and a 4-beam scale, with a 2-cu. yd. 50S Koehring drum mixer. Batched aggregates discharge through a bypass chute around the mixer for loads to be mixed in transit.

An 82-cu. ft. Ingersoll-Rand air compressor driven by a 5-hp. motor develops the air pressure needed to keep cement flowing into the batcher,



**To the left: Close-up of concrete mixer and ready mix truck receiving a load. To the right: Plant conveyor to transport aggregates from tunnel conveyor**

# CEMENT DISPERSION
## *and its five advantages*
## OBTAINABLE WITH POZZOLITH



*Unusual installation of an Imhoff Tank where Pozzolith Concrete was poured on a 45 degree slope without the use of forms. In the maze of reinforcing steel Pozzolith created easier, quicker placeability.*

## AN OUTSTANDING TECHNOLOGIC ADVANCE THAT BENEFITS ALL CONCRETE

Application of the Principle of Dispersion through POZZOLITH raises the efficiency of portland cement to the maximum and produces these advantages:

1. Durability increased 50% or more.
2. High Early Strength — 20% or more increase in compressive strength at all ages.
3. Water reduction, up to 20% — slump increased 150% or more for given water ratio.
4. Increased water-tightness — 20% or more reduction in absorption and permeability.
5. Reduced bleeding and segregation.

### SPEED AND ECONOMY

In addition to the above advantages POZZOLITH speeds up the job but adds no increased over-all cost and in many cases substantial savings are made.

### WIDELY USED

Ten years of use by representative engineers, contractors and owners, everywhere, have now made its acceptance general.

### MAKES ALL THE CEMENT WORK

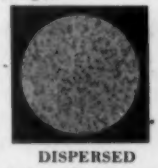
Today hundreds of thousands of cubic yards are being placed on defense and industrial projects more quickly, more easily, and with greater economy through the cement-dispersing ability of POZZOLITH which exposes the entire surface area to the water and thus makes all the cement "work".

The complete story of Cement Dispersion and POZZOLITH will be sent on request.

## HOW POZZOLITH WORKS

Pozzolith contains Master Builders' cement dispersing agent. Cement particles in their normal state in water tend to gather together in bunches; i.e., flocculate. This bunching entraps water within the particle clumps. See microphotograph at right.

UNDISPERSED



DISPERSED

With Master Builders' dispersing agent these bunches are broken up into individual cement particles distributed throughout the water; i.e., dispersed or deflocculated. See microphotograph at left.

This dispersion makes the cement usable to its full efficiency; all the cement surface is made available for hydration and all the water for lubrication of the mix. (Water held within the particle clumps is released.)

As a result of adding Pozzolith to cement mixes there occur the five advantages listed.

**CEMENT DISPERSION SPEEDS DEFENSE— SAVES MONEY!**

"Remember — by adding POZZOLITH to regular portland cement, purchased at economical prices, you get high early strength and a more rapid completion of the job. Here is economy in material cost and time."

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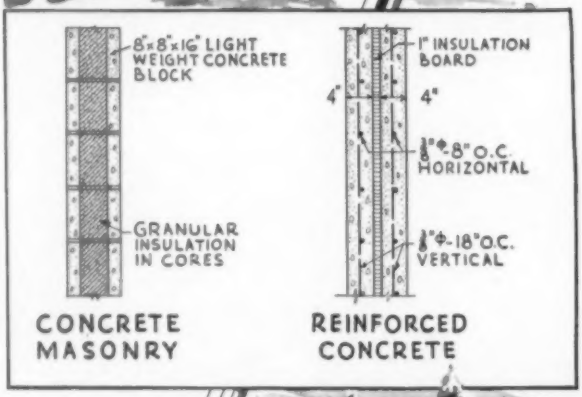
CLEVELAND, OHIO — TORONTO, CANADA

# MASTER BUILDERS



*Concrete Homes Offer*

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**PROOF:** Tests at the University of Minnesota, sponsored by the American Society of Heating and Ventilating Engineers, have shown very satisfactory insulative values for wall designs of concrete and concrete masonry. Values are controlled by wall thickness, kind of aggregates and methods of insulation. (Any heating engineer or architect will tell you that the wall designs sketched above are adequate for severe climates.)

**MORE PROOF:** Hundreds of concrete home owners, in all parts of the country, testify that their concrete homes are cozy and dry in winter, cool in summer, and that heating costs are low.

Home seekers like the idea of concrete for its fire-safety, economy, distinctive appearance. And they'll want concrete all the more when they know the complete facts about the *year 'round comfort* this type of construction assures at reasonable cost. Feature the comfort of concrete in your demonstration homes this year.

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....Bags
....Bagging Machines
....Balls (Grinding)
....Barges
....Batchers (Weighing)
....Batching Plants
....Bearings
....Belt Repair Equipt.
....Belting (Conveyor & Elevator)
....Bin Level Indicators
....Bins (Storage)
....Blasting Supplies
....Block Machines, Building
....Boats
....Brick Machines & Molds
....Buckets
....Building Tile Machines
....Bulk Cement Batching Plants
....Bulk Cement Storage Plants
....Bulldozers
....Bullscrapers
....Burial Vault Forms
....Calcining Equipment
....Calcium Chloride
....Carbon Dioxide Plants
....Cars (Industrial)
....Catch Basin Block Machines
....Cement Colors
....Cement Process
....Central Mixing Plants
....Chimney Block Mach. & Molds
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....Concentrators
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....Concrete Paints & Coatings
....Concrete Waterproofing & Dampproofing
....Contractors (Cement Mill)
....Conveyors
....Conveyor Idlers and Rolls
....Coolers
....Corn Crib Block & Tile Mach.
....Correcting Basins
....Cranes (Crawler & Locomotive)
....Crushers
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....Curing Equipment
....Curb Forms
....Derricks
....Dewatering Equipment
....Diesel Engines (Stationary & Automotive)
....Dippers & Teeth
....Disintegrators
....Dragline Cableway Excavators
....Drain Tile Machines
....Dredges
....Dredge Pumps
....Drills (Rock)
....Drill Bits
....Drill Sharpening Machines
....Drill Steel
....Drives (Gear Reduction)
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....Guns (Hydraulic)
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....Hoppers
....Hose
....Hydrators (Lime)
....Induced Draft Fans
....Joist & Slab Machines
....Kilns (Rotary, Shaft, Vertical)
....Laboratory Apparatus
....Lift Trucks
....Lime (Hydrated)
....Lime Handling Equipment
....Lime Plants
....Lime Putty Plants
....Loaders
....Locomotives
....Lubricants
....Manganese Steel Parts
....Mills (Ball, Compartment, Emery, Hammer, Rod, Roll, Tube)
....Mortar Mixers
....Pallets (Steel, Wood)
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....Pipe (Dredge)
....Pipe Molds and Machines
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....Pneumatic Hammers
....Portable Aggregate Plants
....Pulverizers
....Pumps (Pulverized Material)
....Railway Equipment
....Rectifiers
....Recuperators
....Refractories
....Rewashers (Screw)
....Rock Wool Cupolas
....Roofing Tile Machines
....Sand Dryers
....Sand & Gravel Plants
....Sand Lime Brick Machinery
....Sand Settling Tanks
....Scales
....Scrapers (Power Drag)
....Screens (Revolving, Vibrating, Etc.)
....Seal Rings
....Septic Tank Molds
....Sewer Pipe Machines
....Shovels (Power)
....Silos (Storage)
....Silo Stave Machines
....Slakers (Rotary)
....Slurry Mixers
....Slurry Pumps
....Slurry Separators
....Slurry Thickeners
....Soft Stone Eliminators
....Speed Reducers
....Structural Steel Fabrication
....Tampers (Hand & Power)
....Tanks (Storage)
....Tires
....Tractors
....Transit Mixers
....Trucks (Agitator)
....Trucks (Dump)
....Trucks (Industrial)
....Trucks (Mixer Body)
....Unloaders
....Unloaders (Boat)
....Unloaders (Box Car)
....V-Belting
....Vibrators (Bin)
....Wagons (Dump)
....Wall Forms & Machines
....Washers (Sand, Gravel & Slime)
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....Well Curbing Mach. & Molds
....Wire Cloth
....Wire (Copper, Iron & Steel)
....Wire Rope
....Wire Rope Fittings

*Firm Name* _____

*Individual* _____ *Title* _____

*Address* _____

*City* _____ *State* _____

## Continuous Flow Batching

*(Continued from page 96)*

and hot air heaters are sufficient to prevent freezing in the bins, since the batching floor is entirely enclosed.

The fleet consists of 12—2-cu. yd. Jaeger standard mixing drums, two 3-cu. yd. Jaeger high dump mixers and two 3-cu. yd. T. L. Smith hi-dump mixers. Two Fords, six Internationals, six General Motors and two White chasses are used. All of the delivery equipment is painted a brilliant red color and kept that way as a useful bit of identification and advertising.

This plant has been in operation a little over a year, and thus far has made good use of surpluses from the mixer drums, in paving some parts of the yard and in laying concrete floors in garages being built for the truck fleet. Some of this concrete is also utilized in casting concrete piers which lumber is stacked on in the company's lumber yards. W. B. Jones is manager of the ready-mixed concrete operations.

# Ready Mixed Concrete Directors' Meeting

AT THE SEMI-ANNUAL MEETING of the Board of Directors, National Ready Mixed Concrete Association in Chicago on June 25th a full program of matters of policy was considered. Decisions were reached on what the industry should do with regard to priorities, new demands made upon members by the International Union of Operating Engineers, tests for truck mixers and federal legislation, as well as the more routine business of setting the time and place for the 1942 convention, and a discussion of finances and membership.

Unanimous approval was given a motion to coöperate with the National Crushed Stone Association which is celebrating its 25th anniversary, in selecting Cincinnati again as the place for the annual convention. The dates are January 27, 28 and 29, at the Netherland-Plaza hotel. It was decided that the policy of having informal, open-forum meetings would be continued. There will also be a machinery display as in the past.

New demands from the International Union of Operating Engineers stimulated a lot of discussion. Several instances were mentioned where attempts had been made to have members of the hoisting engineers union substituted for men on the job who are members of the Teamsters and Chauffeurs' union. An eastern producer of ready-mixed concrete told of the hoisting engineers' union in his locality attempting to have men transferred from the teamsters' union to that of the hoisting engineers, with the promise of no increase in union dues. In another case a union agent was told to get out several months ago and he hasn't come back.

It was decided that ready-mixed concrete companies should, quite naturally, not accept demands which would place extra engineers on trucks or to supervise dumping, even though some of the added cost might be assumed by the contractor. Whoever assumes the added burden, the result would be an increased and unfavorable price for ready-mixed concrete.

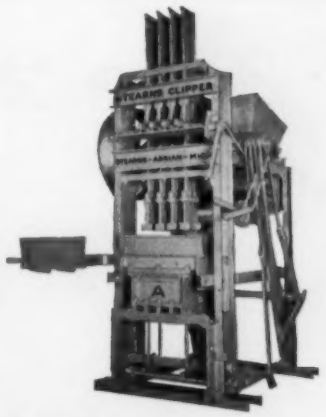
As to the status of owner-drivers under the Social Security Act, the law is quite vague. The case of the Grand Rapids Gravel Co., Grand Rapids, Mich., was reviewed. The ruling has been made, in this company's case, that these drivers are employes, not contractors. That company is paying for social security for these men under protest and is to make an appeal for a refund. The decision to be made will undoubtedly set the precedent for similar cases over the country, and probably for the aggregates industries as well, which also sometimes hire owner-operators.

As to the determination of minimum wages under the Walsh-Healey Act, the ready-mixed concrete industry will soon face a public hearing, said Executive Secretary V. P. Ahearn. This Act applies on government contracts.

In determining the status of truck drivers in industry with respect to the Motor Carrier Act and the Federal Wage-Hour Law, legal counsel is coöperating with the Association. Mr. Ahearn emphasized that the interstate provisions of the Motor Carrier Act apply even if there is a delay of a day or, even a year, in the movement of the materials in question.

Priorities resulting from the national defense effort and their effects on the industry were discussed. It is expected that producers of ready mixed concrete in certain areas may have trouble in getting repairs and replacements for equipment and that they will be handicapped in getting new equipment. It is estimated that

*(Continued on page 102)*

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Complete equipment for making concrete, cinder and other light weight aggregate units, including engineering service for plants and revamping of old ones for more economical service. Hobbs block machines, Anchor tampers, Anchor Jr. strippers, Stearns power strippers, Stearns Jolicrete, Stearns mixers, pallets, Straublox Oscillating attachments, etc.

Repair parts for Anchor, Ideal, Universal, Stearns, Blystone mixers and others.

**Anchor Concrete Mchy. Co.**

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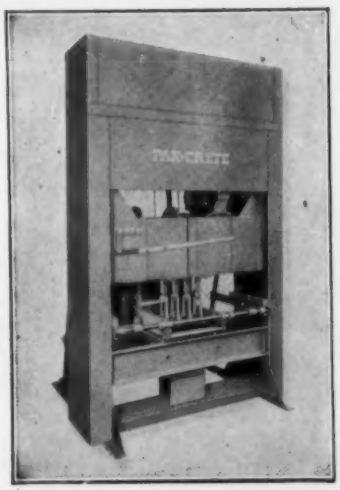

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## This group of Ransome Truck Mixers

**includes the 28th Ransome in this operator's fleet. Confidence in Ransome performance is reflected in repeat orders such as this. When next considering truck mixers it will pay you to investigate Ransome.**

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Clipper Folder tells how power is progressively applied to block-making operations.

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Clipper Stripper produces more blocks per man per day than any other machine with comparable power operation.

**Low Initial Investment**

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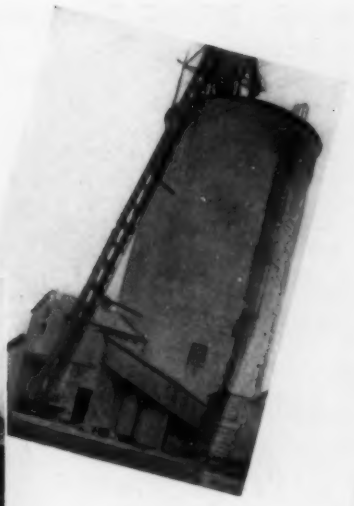
Geno Olsen, President

# Paint Mixer Trucks Different Colors

**McElwee & Rogy, Inc., ready-mixed concrete plant, uses gravity flow for all materials**

By RALPH S. TORGERSON



Above: Gravity-fed ready mixed concrete batching plant. Bucket elevator takes aggregates to the top of plant from hopper to the left, and cement is removed in sacks in covered conveyor leading from railroad track platform to cement storage room. Left: One of the 5-cu. yd. transit mixer trucks

A SINGLE LARGE CONCRETE SILO type structure houses all the batching equipment and storage facilities of the McElwee & Rogy ready mixed concrete operations in Peoria, Illinois.

It is an interesting structure as it is simple in design and yet very efficient in operation. Sand and gravel aggregates produced at the company's two pits near Peoria are dumped into a large truck receiving hopper adjacent to the ready-mixed concrete plant, and are elevated by a Webster-Weller bucket conveyor, 121-ft. centers to the top of the 88-ft. silo and then chuted into an 8-compartment bin, each compartment of which is 48 ft. deep and holds 240 tons. Sacked cement is transported from box cars by an enclosed Barber-Greene conveyor, 40-ft. centers, to a cement store house supported by the concrete driveway walls projecting out from the silo.

Aggregates are weighed out by McDonald Engineering Co. batching equipment of special design which is shown in one of the illustrations. The eight vertical levers control the respective slide gates of the bin compartments having chutes leading to the tapered cylindrical weighing hopper. A six-beam Toledo scale is used for weighing. The scale is set for the total weight of all the aggregates, and then as the levers are pulled, the scale dial goes to zero which gives a double check.

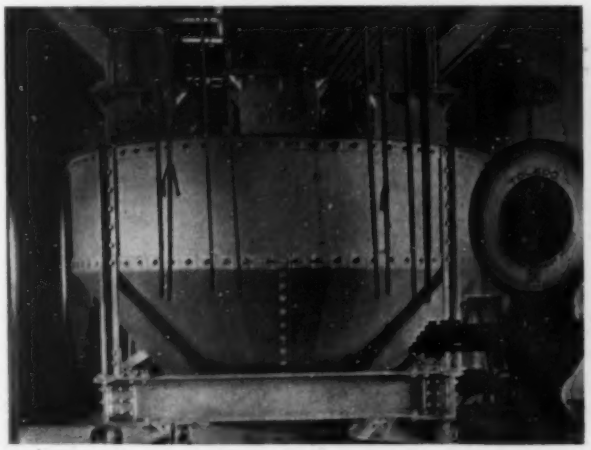
Water is metered out accurately by a hand-controlled valve in any amount desired by making the proper setting. The welded water tank is steam-heated by coils around which the water circulates so that ready mixed concrete can be distributed during the coldest winter weather.

### Trucks of 5 Cu. Yd. Capacity

Each mixer truck is painted a different color, and as far as possible the same drivers are kept with each truck. This serves a double purpose. The driver becomes responsible for one piece of equipment, and the plant easily identifies the type of truck, its capacity, and the driver by the color of the truck. It also simplifies records.

In all there are six mixer trucks, two Rex and four Ransomes. All the Ransome units (present equipment now in service), are 5 cubic yard capacity, and are mounted on Le Moon, Sterling and Diamond T chassis.

Officers of the company are: James F. McElwee, Jr., president and general manager; Chas. T. McElwee, vice president; Chas. T. McElwee, Jr., secretary, and Donald Rogy, treasurer. L. A. Slager is superintendent of the ready-mixed concrete plant.



Batching hopper and control levers to release aggregates. Note corrugated steel chutes, above

Automatic scale for batching, to the left, and water measuring and heating equipment, to the right

## Ready Mixed Concrete Director's Meeting

*(Continued from page 99)*

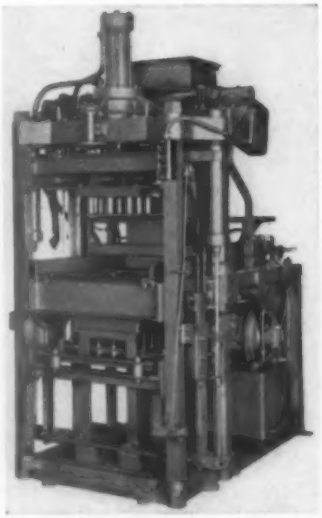
95 percent of all the industry's contracts are connected in some way with national defense, which will make acute any shortages of supplies, oil and other essentials.

Transportation priorities, which have not been involved yet, will likely be most serious, said Mr. Ahearn, who anticipates difficulties soon in getting deliveries of aggregates and cement. A member from one of the transit mixer manufacturing companies stressed the necessity of having priority numbers for mixers and for repairs already. He said that there was no difficulty yet from the mixer manufacturers not being able to handle repairs. Evidently there is much more difficulty to getting trucks than the mixer drums. At the conclusion of the discussion, it was decided to address a letter to individual ready mixed concrete concerns, and if any particular difficulties are discovered as a result, to impress upon OPM the importance to the national defense program of the ready mixed concrete industry.

STANTON WALKER, engineering director, reported on the status of A.S.T.M. specifications for ready mixed concrete. It has been proposed to delete some of the general wording in a revision to the specification which will make it possible to hand the specification over to customers who can then simply drop the specification for ready mixed concrete into their general specifications.

As to policy with respect to issuing certificates to truck mixer manufacturers it was generally agreed that with the advent of new models and types of mixers all the time, it would be impractical to study and pass on all of them, and it was therefore decided to delete the reference to certification in the specifications. Among the proposed alternatives first was a suggestion for formation of a "mixer manufacturers bureau" or a substitute clause that concrete be delivered in mixers and agitators that have been studied and manufactured by approved companies.

**HYDRAULIC VIBRA-PRESS**



A High Production Machine
Making Blocks which are
Demanded by the Contractor
Endorsed by the Architect
Desired by the Mason

The KENT MACHINE CO.
CUYAHOGA FALLS, OHIO

### Concrete Block Is Ventilated

VENTILATED BLOCK CO., Detroit, Mich., has brought out a concrete block of unusual design. This patented block is said to have thicker walls and the position of the connection web is stronger than the standard designs now used. A wall laid up with these units has outer and inner faces of 2-in. thickness in an 8-in. wall and 2¾-in. in a 12-in. wall.

The principal feature emphasized in this block, however, is the free movement of air between the outer and inner faces which operates to equalize the temperature of all the walls of the building and breaks up the transfer of heat into two distinct steps. This wall can be considered as consisting of two envelopes of concrete, one inside the other but completely separated, because the area between is ventilated with air passing through the upper and lower vents, heat losses being controlled by a shutter on basement vents.

Outer vents permit escape of any vapor which may be between the walls. In mild weather the inner vents are kept open, but as the weather becomes colder the passage of air through the inner wall becomes undesirable because of possible moisture accumulation and loss of heat and the vents are gradually closed.

It is claimed that transfer of moisture at mortar joints is not possible with this type of block because the joint does not extend through the wall, the necessary bearing being obtained by a wider bearing surface at the outside and inside walls of the block.

### Historical Document

JOHN L. SENIOR who for many years was an outstanding figure in the development of the American portland cement industry, according to newspaper reports, is the owner of John Paul Jones' commission as Captain of the United States Navy. The commission was issued in 1776 and signed by John Hancock, President of the Continental Congress. Mr. Senior has loaned it to the Federal government as part of the John Paul Jones collection at the U. S. Naval Academy, Annapolis, Md.

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**JACKSON CONCRETE BRICK MACHINE**

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Part of Maule Industries' fleet of transit-mixer trucks. F. K. Foster, yard superintendent, in foreground

By HARRIE H. BIERMAN

# Special Mixes to Order

**Twenty-nine mixer trucks deliver over 100,000 cu. yd. of concrete to jobs requiring widely different mixes in Miami, Fla., area**

CONSIDERING its population and size, South Florida is one of the nation's best customers for concrete. Exclusive of concrete masonry units, building operations in the area require an annual output of something like 500,000 cu. yd. of concrete. And at least 50 percent of it classifies as "ready mixed."

Of this amount Maule Industries, Inc., which has plants in Miami, Miami Beach, Ojus and Fort Lauderdale, contributes approximately 100,000 cu. yd. Probably the largest, and certainly one of the oldest local producers of this type of material, the firm specializes in transit-mixed concrete.

Viewed from the contractor's angle, the picture is something like this: Keen competition has reduced the margin of profit per job. That means he has to take on more construction in order to stay "in the black." Consequently, he must spread his supervision over a wider area.

If he manufactures his concrete on the job, the materials must be ordered and checked in, mixing equipment transported to and from "location," street-obstruction permits secured, and disposition must be made later of left-over materials. "Ready mix" solves these problems.

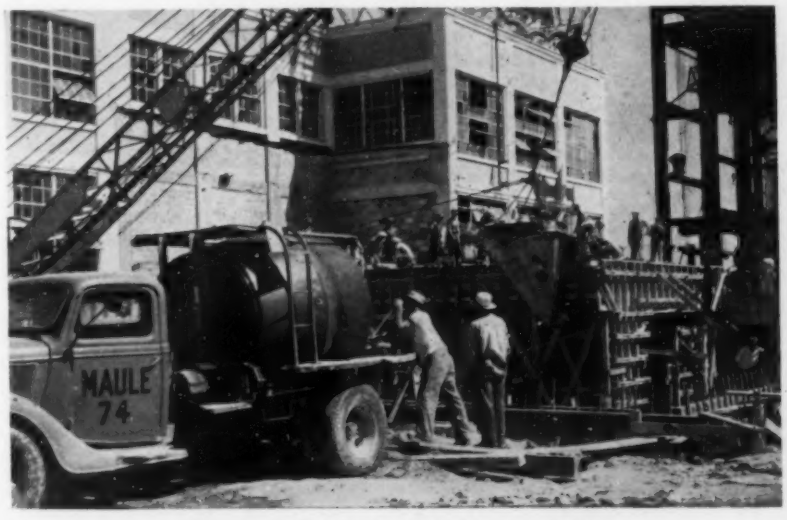
Twenty-nine mixer trucks in four types serve the firm's customers. At each of its plants the representative of a testing laboratory supervises the batching of every order, and the invoice covering it bears his signed certification.

In South Florida concrete is an almost universal building material. Its use ranges from major construction to fence posts. Consequently Maule must be prepared to deliver transit mixed concrete conforming to a wide variety of specifications. These may call for "imported" aggregates, as well as those locally-produced. Coarse and fine, the latter are derivatives of o'olite rock.

In furnishing concrete for chain-store and office buildings and three USHA housing-projects the company has had to meet the requirements of Federal and corporation architects and construction experts. At the time of writing, a "special mix" was being furnished for foundations to support a power company's installation of turbines.

Specified by the power firm's New York engineering consultants, the mix called for Hudson River gravel and Florida freshwater sand. The theory behind the gravel specification is that it gives a high vibration-resistance to concrete made with it.

Designed for 4500-lb. strength, the batching formula worked out by the testing laboratory and the power company's resident engineer was 6 sacks of cement, 1200 lb. of sand, 1950 lb.




Unloading special mix for turbine foundation

Illustrating truck-to-form service of Maule Industries ready mixed operations

of gravel and a hydrating ratio of 6.4 gal. of water per sack. Deliveries were made from the Miami Beach plant, which like each of the other three, is equipped with Blaw-Knox batchers, having a capacity of 40 cu. yd. per hour.

To maintain the pour the plant produced at the rate of 36 cu. yd. continuously for 11 hours. Scheduled on 20-minute running time between yard and job, mixer trucks kept pace with the output.

For the customer who has no rigid specification to meet, a standard mix is available. Having a strength of 2500 lb., it meets local building-code requirements for many purposes. Its formula approximates 1:3:3½.

In the south Florida area a mix is now seldom expressed in terms of a cement-and-aggregates ratio. It usually is indicated by its designed compressive strength or by its cement content; that is, a "5-bag mix."

According to V. L. Tyson, laboratory inspector at Maule's Miami Beach plant, the proper mixing period is from 30 to 60 minutes, but for many purposes concrete is usable after having been agitated for two hours.

Some architects and construction experts limit mixing to 30 minutes and prefer the time cut still further. However, this company's yards are so located with reference to probable building areas that, as a rule, no difficulty is experienced in meeting whatever time requirements its customers set up.

But flexibility in operating methods is one of the firm's chief characteristics. On at least two occasions, when it was supplying over 10,000 cu. yd. of concrete to each of several USHA projects, a portable Blaw-Knox batcher was set up on the job.

Charged here, eight mixer trucks delivered concrete to the forms. In this way, not only was it possible to set up closer time-control but an economy in the use of mixer trucks also was affected. Located in hitherto undeveloped sections, the projects included the laying of sidewalks and walkways. These, too, were poured directly from the mixer trucks.

On a large building constructed not long ago for an automotive firm, the mixer trucks operating over decidedly rough ground chuted the mix to all footing and foundation forms. Until support columns and beams were poured, not a barrow or a bucket was necessary.

Maule's mixer truck fleet consists of 20 Blaw-Knox, two Jaegers, three Rex and four Smiths. F. K. Foster, yard superintendent at Miami Beach, explains that this lack of uniformity in mixer-truck equipment arose from his company's desire to take advantage of mechanical improvements, as they were made by various manufacturers.

However, the firm already has standardized on Ford V-8 as chassis equipment. Mixing machinery was standardized long ago. As mentioned above, this is Blaw-Knox. Northwest tractor cranes are used for the handling of aggregates. Most of this type of material is transported by barge from production points to yards.

Except for specified aggregates originating in areas outside of South Florida, this company produces its own, principally at the Ojus plant, about 10 miles north of Miami.

"In the past five years," said Mr. Foster, "the use of 'ready mix,' as compared with job-mixed concrete, for all types of building has increased 100 percent. Except for major construction work, the contractor no longer can afford to mix his own."

Mrs. Katherine C. Maule, widow of its founder, E. P. Maule, heads Maule Industries, Inc. C. B. King is the firm's general manager, and H. G. Heether is its sales manager.

## Ready Mix for Airport

ST. CATHARINE GRAVEL CO., INC., Natchez, Miss., has completed construction of a plant near Biloxi, Miss., in Oak Park adjacent to the airport to furnish ready mixed concrete for construction there. An estimated 40,000 cu.yd. of gravel will be shipped to Biloxi by barge for the project. Probably ten transit mixers of 2-cu.yd. capacity will serve the job. John R. Junkin of Natchez is superintendent for the company.

## Fire Walls of Masonry

CUNARD LANG CONCRETE CO., Columbus, Ohio, has a contract for 250,000 concrete block for the fire walls in four new bomb-proof warehouses under construction at the General Depot, and many other sizeable contracts. More than $25,000 had been invested in the plant last winter for new equipment, including a Besser Vibrapac block machine, to increase capacity. Production is averaging 5000 block daily.

## New Concrete Block

DODGE-HORTON SALES CO., Seattle, Wash., has taken over the national distribution and manufacturing rights of "Ty-Blox," a new design of interlocking block that requires no mortar when laid up in a wall. Robert D. Wells, Seattle is the inventor of "Ty-Blox."

## Ready Mix Expansion

READY-MIX CONCRETE CO., Muskogee, Okla., has been granted a building permit for a warehouse and batching plant to be built in the city.

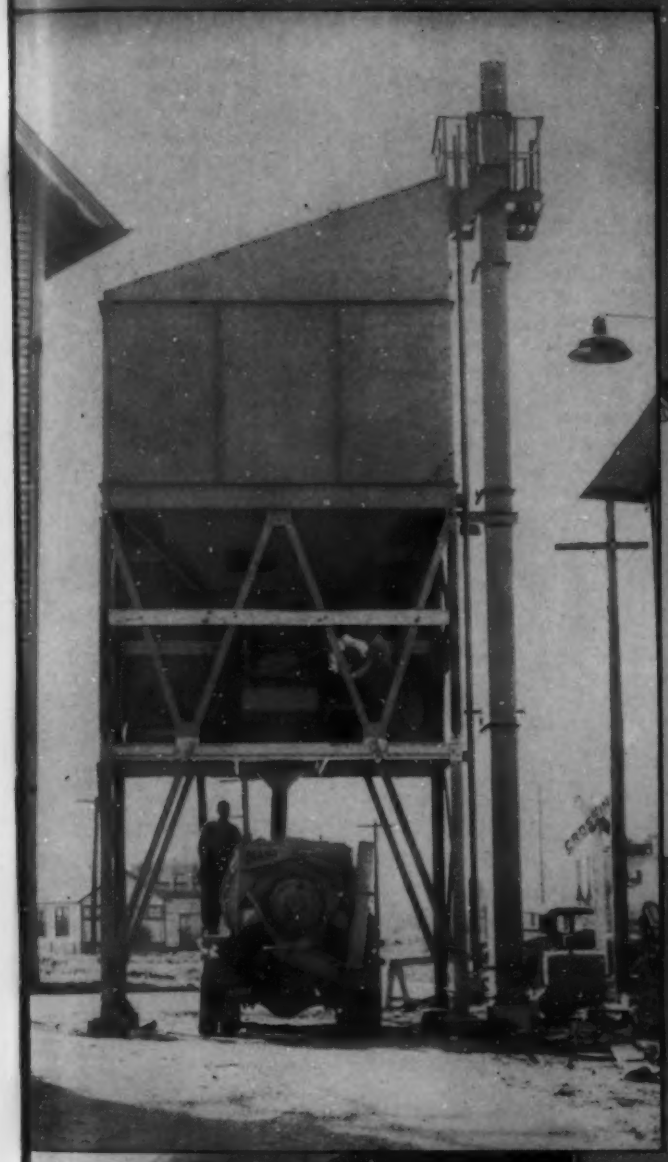
## Batching Plants for Defense

BIRMINGHAM SLAG CO., Birmingham, Ala., has one batching plant in operation and another is being completed at Anniston, Ala., to furnish ready-mixed concrete at the Anniston Ordnance Depot. Much of the concrete is to be used in building igloos for the storage of ammunition.

## Ready Mix Plant

MESABA CONSTRUCTION CO., Hibbing, Minn., has built a new ready-mixed concrete plant, with a 2-compartment aggregate bin and cement bin and with two truck mixers for delivery. It is said to be the only ready-mixed concrete plant on the Range.

# HELTZEL Bulk Cement Plant Operators Produce More Ready-Mix Concrete per Hour at a Lower Cost per Yard



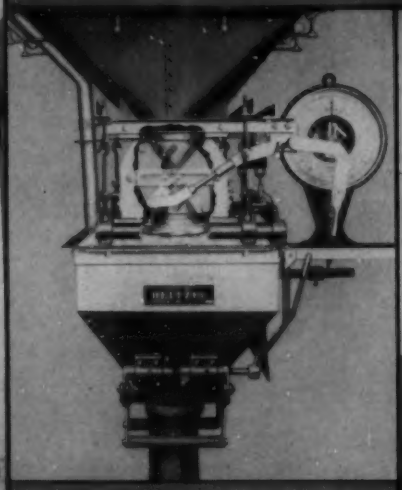
Standard Equipment from 100 to 1500Bbls.

Units Available to Fit Any Yard Set-up . . .

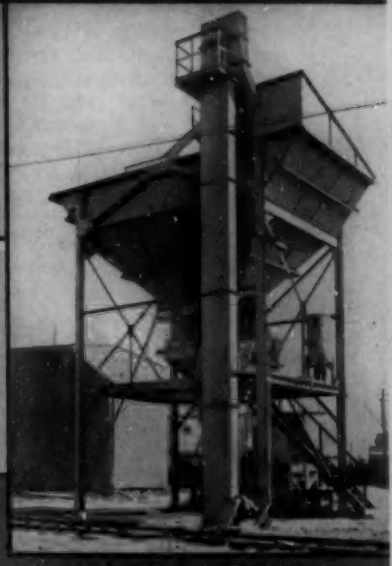
**Portable . . . Semi-Portable . . . Stationary**

. . . Investigate Today . . .

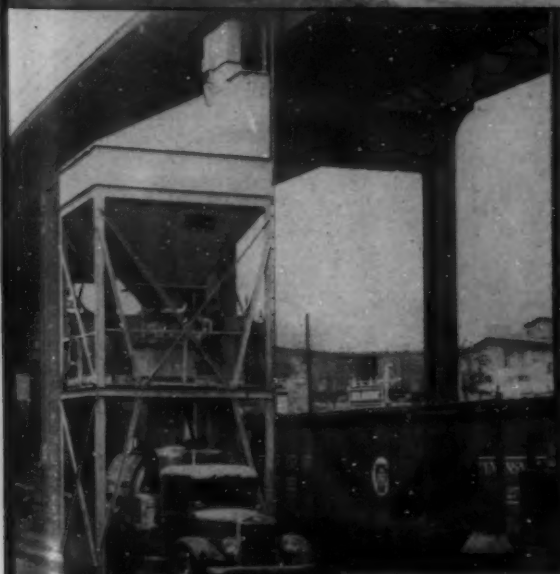
Ask for Heltzel Bulletins T-28 and B-31



Cut away view of Heltzel Dustless Bulk Cement Batcher. Note water-tight Rubber Valve between bin hopper and batcher. All Heltzel Bulk Cement Plants are equipped with this batching unit.



Heltzel Combination Batching Plant. Accommodating 200 tons of aggregates and 325 bbls. of cement for weight batching all aggregates and cement in one operation.



Heltzel Model E-2 Semi-Portable Bulk Cement Batching Plant. 300 bbls. capacity. Note especially large driveway clearance.

Heltzel Model E-1 150 bbl. Portable Bulk Cement Plant with built-in elevator. Plant may be quickly and easily moved from one location to another without dismantling elevator casing, chain or buckets.

600 and 1500 bbl. Bulk Cement Tanks accommodating 4 grades of cement. 50 cu. ft. batchers suspended on Springless Kron Dial Scales. Tanks charged with the Heltzel Air-veyor system.

**HELTZEL** STEEL FORM & IRON CO.
WARREN, OHIO · U. S. A.

# Dispersion Agents in Portland Cement

AN EXCELLENT discussion of the functions of a dispersion agent in portland cement has been written by Dr. E. W. Scripture, director of the research laboratory of the Master Builders Co., Cleveland, Ohio, and published by that company, which manufactures the well-known admixture "Pozzolith." In that paper Dr. Scripture explains that, in general, the reactions on which portland cement depends for its properties are surface reactions. They are, therefore, a function of the surface area of the cement, and for this reason cement manufacturers have increased the fineness of grinding. Unfortunately the full surface area produced by fine grinding is not available for reaction, due to the flocculated condition of the cement in the mix; this agglomerating tendency is even greater with greater fineness, so that the beneficial effects of fine grinding have been in some measure offset by the formation of lumps. The addition of a dispersing agent to portland cement mixes makes available for reaction the full surface area of the cement particles, and permits the use of the cement to the full extent.

### Effect on Properties

Dispersion of the cement basically changes the relations of the solid particles to the liquid, and consequently may be expected to have a profound influence on many of the characteristics of the concrete or mortar. These effects may be divided into two groups corresponding to the two states in which concrete exists: (1) the transitory plastic stage during placing, and (2) the ultimate hardened mass.

The plastic state is the period during which the concrete or mortar is placed, compacted, and finished. Unless the mix is workable at this time, a sound structure will not be produced regardless of any other properties of the mix. This property of workability may be considered as made up of (a) mobility or ease of flow, and (b) cohesiveness or resistance to segregation. Dispersion of the cement particles will increase mobility or ease of flow. This is because the water held in the lumps or agglomerates of the flocculated cement is released to become a part of the fluid medium through which the particles move. Further, by breaking up these lumps, the size of the units in the liquid is reduced so that they can move more easily past each other in the fluid. The result is a more workable concrete produced with less water.

Cohesiveness is attributable to the attractive forces between surfaces. Therefore, dispersion of the cement which makes available a greater surface area will increase the cohesiveness of the mix. A first result is that the mix becomes "fatter." A more generally important effect is a reduction of the tendency of the components of the mix to separate. The aggregate is less apt to separate from the cement paste, so that the danger of honeycombing is minimized. In its upward movement through the mix the water tends to collect under the larger pieces of aggregate, forming pockets on the underside so that the aggregate is not bonded to the cement paste. Separation of the water and fines in an upward direction from the coarser part of the mix is prevented. By this means "bleeding" or "watergain" and the formation of laitance are eliminated or reduced, and the uniformity of the mix in place is enhanced.

A further effect of dispersion, also due to the greater surface area available, is a greater force holding the water to the cement particles. This produces higher "water retentivity," which is particularly important in masonry mortars where porous masonry units tend to suck water out of the mortar. The volume changes which occur during the hardening of concrete are in all probability more important than those which take place subsequently. They are caused by movement of water from one part of the mix to another, and by loss of water from the mix by suction, by evaporation, or by other means. Dispersion of the cement counteracts these volume changes, first by reducing the amount of water required for a workable mix, and second by imparting higher water retentivity, thus resisting movement and loss of water.

The effects of dispersion of the cement particles on plastic concrete or mortar may be summarized as follows: (1) More workable concrete with less water; (2) increased "fatness;" (3) reduced segregation and bleeding; (4) greater water retentivity; (5) reduced shrinkage before hardening.

Dispersion affects practically all the important properties of the hardened concrete or mortar. This is due primarily to two causes. First, the reduction of the amount of water required in the mix; secondly, the dispersion of the cement particles produces a finer grained structure in the cement paste and an increased surface area such that the hydration reactions of the cement proceed more effectively. Some of the more important properties may be considered in somewhat more detail.

*Durability*—Since the attack of corrosive solutions is a reaction occurring at the surface where the solution comes in contact with the cement, the rapidity of attack is dependent on the ability of the corrosive solution to penetrate into the structure and on the ability of the cement to resist attack. The ability of the solution to penetrate is governed by the same factors which contribute to watertightness. Hence, a dispersing agent increases resistance to corrosion.

Disintegration by freezing and thawing is primarily dependent on the ability of water to penetrate into the concrete and on the strength of the cement paste to resist this force. Since a dispersing agent reduces permeability and in other ways makes the concrete more watertight, and since it also increases strength, it will increase resistance to freezing and thawing.

*Watertightness*—Watertightness is dependent on freedom from defects, freedom from cracks, and on permeability. Since the use of a dispersing agent results in an improvement in all these respects it will increase watertightness.

*Strength*—Strength will be increased by the reduction of water made possible by dispersion. The greater surface area made available by dispersion also leads to greater and more rapid hydration, so that further improvements in strength are obtained.

*Permeability and Absorption*—Permeability and absorption are proportional to the volume of excess water per unit volume of concrete. The reduction in the excess water required for workability by the use of a dispersing agent reduces permeability and absorption.

*Volume Change.*—Volume change is proportional to the volume of cement paste per unit volume of concrete. Reduction in the water reduces volume change.

*Uniformity*—The uniformity of the hardened structure and freedom from defects will be improved due to the improvement in the properties of the plastic mix.

## In these days . . .

## . . . would you try a truck tire with 80% more mileage - - - ?

"Yes, of course I would," you answer. "American industry today demands economy, speed and safety of everyone."

That's right it does, not only of truck tires but wire rope, and—

### THERE ARE EQUALLY GOOD REASONS TO TRY HAZARD LAY-SET *Preformed*

More mileage (tonnage, yardage, what have you) is characteristic of Hazard LAY-SET Wire Rope. Why? Because it is preformed at the time of manufacture, and the preforming process endows LAY-SET with extreme fatigue resistance (which means longer life). But the preformed endowment doesn't stop with merely longer service. It makes LAY-SET resist kinking and whipping, handle easier and faster—*and safer*. And those qualities answer your own specifications of economy, speed and safety.

Specify Hazard LAY-SET Preformed for fewer machine shutdowns, steadier production, reduced injuries to workmen. All Hazard ropes identified by the Green Strand are made of Improved Plow Steel.

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## Cement Production Doubled

LEHIGH PORTLAND CEMENT CO., Metaline Falls, Wash., plant recently doubled its production by placing in operation the second of two kilns because of a general increase in volume of orders. The company has finished the pouring of five concrete silos for its new storage and distribution plant under construction in East Spokane, Wash.

## Wages Increased

U. S. DEPARTMENT OF LABOR, at the request of the National Defense Mediation Board to settle the controversy between 250 employes of the Smoot Sand and Gravel Corp., Washington, D. C., has effected an agreement acceptable to the union. A wage increase of from 3 to 10 percent with time and a half for overtime has been granted. Hours have been reduced from 70 to 64 a week for tugboat operators and dredgemen, from 58½ to 55 for unloading men and lighters and from 54 to 51 for shipyard and shop workers.

## To Move Slag Plant

STANDARD SLAG CO., Youngstown, Ohio, has leased land near the Wheeling Steel Corp. plant at Portsmouth, Ohio, and plans to move its Ironton, Ohio, plant to this location late in the Fall. When Standard Slag came to Ironton in 1915, raw materials were received from several local blast furnaces which have since become inactive, and for some time crude slag has been hauled from Portsmouth to Ironton for processing.

## Gypsum Production In Canada Is Up

GYPSUM PRODUCTION in Canada set an all-time record in 1940, with an output of 1,448,788 tons valued at $2,065,933 as compared with 1,421,934 tons valued at $1,935,127 in 1939 which was the previous record year. Canada probably ranked third among the world's gypsum producers in 1940, with Nova Scotia the largest producer followed by Ontario, New Brunswick, Manitoba and British Columbia. The biggest portion of Canadian crude gypsum is shipped to the United States for the manufacture of gypsum products.

## Buy Ready Mix Plant

L. G. EVERIST CO., INC., Sioux City, Iowa, has sold its ready-mixed concrete plant in Sioux City to a newly-organized company headed by Roy S. Krage as president and Irving F. Jensen, general manager. The plant

had been in operation for 12 years and has an average daily capacity of 350 cu. yd. of concrete. Jack Muir will continue to direct yard operations. The new company intends to deal in sand, gravel and cement along with the concrete.

## Biggest Gravel Plant Operating to Capacity

CONSTRUCTION AGGREGATE CORP., Chicago, Ill., is reported to have delivered 300,000 tons of gravel from its deposits at Bass river to its processing plant at Ferrysburg, Mich., from the season's start on April 1 to June 4. From this rate of activity, the company anticipates increasing its yearly tonnage of 1,000,000 shipped in 1940.

This plant was built in 1929-32 at a cost of $2,000,000, making it one of the largest in the country, yet it is working night and day in the production of sand and gravel for shipments by freighter into Chicago, Cleveland and Detroit. Seventy men are employed at the plant and five freighters, one of them 530 ft. in length, are on continuous duty making deliveries. William Wipperfurth is general superintendent of the plant.

## Reopen Silica Plant

SILICA PRODUCTS CO., INC., Guion, Ark., has reopened the plant at Guion and is operating on two shifts to produce 40 cars of sand a week. The plant at Everton, Ark., has been closed down and part of the operating personnel moved to Guion.

## Limestone Project Approved

A PROJECT for quarrying and pulverizing limestone and digging marl and paper mill sludge at Burnett, Wis., for distribution to farmers, involving an allotment of $11,422, has been given federal approval. The project has been placed on a list of works eligible for operation at the discretion of the state WPA administrator.

## Marquette Construction

MARQUETTE CEMENT MANUFACTURING CO., Chicago, Ill., has been issued a $241,000 permit for a plant building at Des Moines, Iowa. The company is engaged in the extensive rebuilding of the Hawkeye Portland Cement Co. plant which it purchased.

## Mica Supplies

MICA is destined to become increasingly important with the further expansion of the program for airplane building, factory construction, electrical machinery production and other defense work which requires the mineral. It is reported that there are still ample stocks of India mica on hand to meet immediate government needs for grades that are produced only on a limited scale in this country, but due to increasing difficulties in shipping, certain non-essential lines of manufacturing in which mica is used will likely be curtailed. Government officials are said to be studying the possibilities of obtaining greater production in this country and to have contracted to take the entire Brazilian output of mica for the next two years.

## Agricultural Stone Plant

LIME PRODUCTS CO., operator of crushing plants at Fayetteville, Berryville and Huntsville, Ark., is establishing an agricultural limestone plant near Harrison, Ark., and has a tentative government contract for 60,000 tons of agstone on hand. The plant will employ 12 to 15 men under the direction of W. S. Brantingham.

## Rock Wool Plant

AMERICAN ROCK WOOL CORP., Wabash, Ind., has established a new rock wool plant at Red Wing, Minn., which will utilize local dolomite for raw material. The corporation was started in 1934 and also operates plants at Wabash and at South Plainfield, N. J.

## Leases Catalina Quarry

COLUMBIA CONSTRUCTION CO. has leased the idle rock quarry at the east end of Catalina Island off of Los Angeles, Calif., in order to speed up construction of 13,500 ft. of the Los Angeles Harbor breakwater that it has under contract.

## Purchases Limestone Plant

CHESTER VALLEY LIME PRODUCTS CO., Chester county, Penn., property has been purchased at a sheriff's sale by the Corn Exchange National Bank of Philadelphia. The bank bought the property for $15,000 and a debt of $72,749.

## Announce Crushed Stone Safety Contest Winners

SOUTH CAROLINA GRANITE COMPANY'S Blairs, S. C., quarry is the winner of the 1940 safety award with a record of 142,386 man-hours without a disabling injury. This company is part of the Southern Aggregates Corporation. The safety contest is conducted by the Bureau of Mines, in cooperation with the National Crushed Stone Association.

Eighteen quarries received honorable mention for having operated without a lost-time injury throughout the contest year. The companies and the winning quarries are as follows: General Crushed Stone Co., Le Roy, Jordanville, and Glen Mills, N. Y., Watertown, and White Haven, Penn.; Alabama Asphaltic Limestone Co., Margerum, Ala.; North American Cement Corporation, Hagerstown, Md., Howes Cave and Catskill, N. Y.; The Warner Co., Devault, Penn.; Marquette Cement Mfg. Co., Oglesby, Ill., Earlham, Iowa, and Cape Girardeau, Mo.; New Haven Trap Rock Co., Plainville, East Wallingford, and Cheshire, Conn.; American Lime and Stone Co., Tyrone, Penn.; and Southern Aggregates Corporation, Reidsville, N. C.

## Other Trophy Winners

IN ADDITION to the National Crushed Stone Association contest, Sentinels of Safety trophies were awarded to the following other nonmetallic mineral groups: The No. 5 limestone mine of the Tennessee Coal, Iron & Railroad Co., near Bessemer, Ala., was the winner in the nonmetallic-mineral mine group; the Dolonah limestone quarry of the same company at Bessemer won the trophy in the quarry group.

## Maximum Economy In Mineral Wool Insulation

THE NATIONAL MINERAL WOOL ASSOCIATION, New York, N. Y., has announced that the engineers and economists of the United States Housing Authority have issued a basic specification for insulation of defense housing, which contains the following important provisions:

"Insulate top story ceilings with loose-fill, bat, or blanket type insulation, in a sufficient thickness to provide a total thermal conductance of the insulating media only (exclusive of air spaces) of not more than 0.083 B.t.u. per hour per square foot per degree F. temperature difference between the two surfaces of insulation."

The following note is made to the architect: "specifying a total thermal conductance of 0.083 B.t.u. (Paragraph (3) under "Scope") requires approximately 3⅝ in. of insulation." The Bureau of Mines circular No. 7166, states: "On the basis of an average saving of even $25 a year with insulation, 200,000 defense houses would save the Nation well over $5,000,000 a year if insulated. This saving is equivalent to 12,000 carloads of coal or 8,400 tank cars of oil."

## Cement Plant Fire

SOUTHWESTERN PORTLAND CEMENT Co., Osborn, Ohio, plant had a fire recently. A five-hour blaze was confined largely to a storage room where 300,000 cement sacks were destroyed. The loss was covered by insurance.

## Concrete Pavement Yardage

AWARDS of concrete pavement for June, 1941, have been announced by the Portland Cement Association as follows:

| | Square Yards Awarded During June, 1941 |
|---|---|
| Roads | 3,877,772 |
| Streets and Alleys | 1,786,463 |
| Airports | 3,112,058 |
| Total | 8,776,293 |

**Now that continuous and efficient production is more important than ever, are you cashing in on the advantages of Preformed "HERCULES" (Red-Strand) Wire Rope? Actual records show that its easy handling, smooth spooling and long life mean a definite saving in both time and money.**

**When you buy Preformed "HERCULES" (Red-Strand) Wire Rope, you get a Preformed wire rope of the very highest quality—not only as to quality of material, but fabrication as well. As it is furnished in both Round Strand and Flattened Strand constructions, there is a right rope for every heavy duty purpose.**

**Why not take advantage of the time and money saving possibilities of Preformed "HERCULES"? Try it, then compare its performance record with that of any other rope you have ever used.**

***We especially recommend the Preformed type of "HERCULES" (Red-Strand) Wire Rope for use on backfillers, bulldozers, carryall scrapers, clamshells, conveyors, cranes, draglines, dredges, hoists, shovels, skimmers and trench hoes.***

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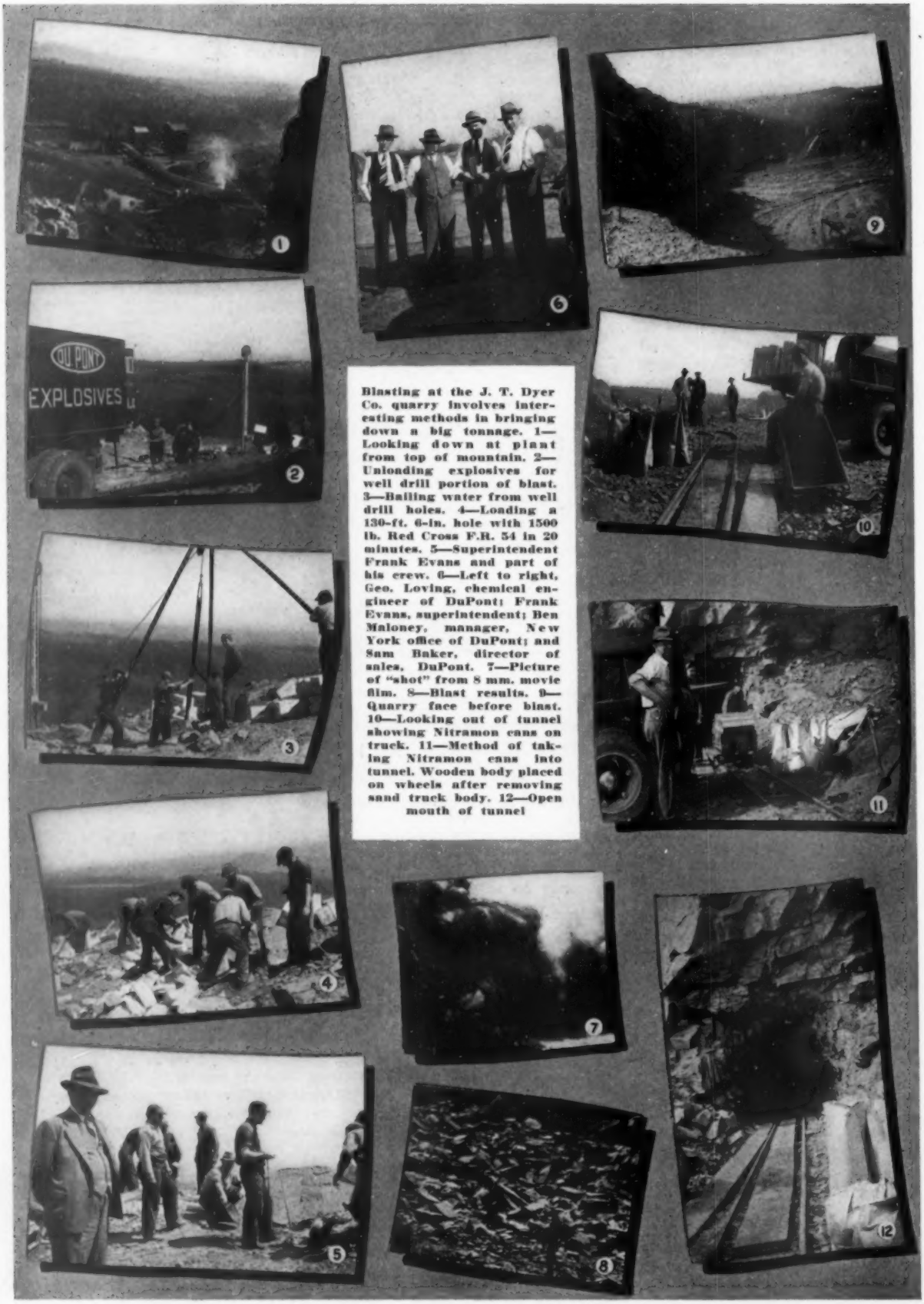



Blasting at the J. T. Dyer Co. quarry involves interesting methods in bringing down a big tonnage. 1—Looking down at plant from top of mountain. 2—Unloading explosives for well drill portion of blast. 3—Bailing water from well drill holes. 4—Loading a 130-ft. 6-in. hole with 1500 lb. Red Cross F.R. 54 in 20 minutes. 5—Superintendent Frank Evans and part of his crew. 6—Left to right, Geo. Loving, chemical engineer of DuPont; Frank Evans, superintendent; Ben Maloney, manager, New York office of DuPont; and Sam Baker, director of sales, DuPont. 7—Picture of "shot" from 8 mm. movie film. 8—Blast results. 9—Quarry face before blast. 10—Looking out of tunnel showing Nitramon cans on truck. 11—Method of taking Nitramon cans into tunnel. Wooden body placed on wheels after removing sand truck body. 12—Open mouth of tunnel

## Season's Opening Blast

**By EDWIN T. WOLF***

OPPOSITE ARE some pictures illustrating an interesting quarry blast, opening the production season this spring at the plant of the J. T. Dyer Quarry Co., Norristown, Penn. It was a tunnel or "coyote hole" blast, in which the main tunnel went 50 ft. in, the right wing 105 ft. long and the left wing 116 ft. Supplementary well-drill holes (nine in all) were 130 ft. deep, being approximately 100 ft. from the quarry floor. The burden over the tunnel was 150 to 230 ft.

The tunnels were loaded with 44,000 lb. of Nitramon and primer, the well drill holes with 9750 lb. of Red Cross free-running No. 54 bag pack and 3750 lb. special gelatine 75, 5 x 24 lowering nets. The total explosive charge was therefore 57,500 lb.

The rock tonnage was calculated at 235,000, but the actual break was about 25,000 tons more.

The blast was exploded with electric blasting caps and a 440-volt current.

Officials of the John T. Dyer Quarry Co. are H. W. Craig, president; Joseph A. Conway, treasurer; Thos. C. McPoyle, sales manager, and Frank Evans, superintendent.

*Blasting expert, E. I. du Pont de Nemours & Co., Norberth, Penn.

## Branch Office for Aggregates

PACIFIC ROCK AND GRAVEL CO., Los Angeles, Calif., has opened a branch office at Torrance, Calif., for handling crushed rock, cement and prepared mixes to local builders and contractors. W. M. Dewey is in charge of the office. The company is supplying materials for several California airports and military posts and is pouring more than $60,000 worth of asphaltic concrete mix at Ft. MacArthur, San Pedro.

## Promote Argentine Cement

THE BUENOS AIRES office of J. Walter Thompson Company has been appointed agency for the Instituto de Cemento Portland Argentino, an organization formed by Argentinian cement companies to increase the use of cement.

## Marking Highway Lanes With Stone Chips

Experiments are now being conducted in Texas and South Dakota with a method of forming marking stripes on the highway surface with stone chips. An application of cutback asphalt is made over the desired width, followed immediately by an application of stone chips. The asphalt is applied by means of a special spray device pushed ahead of a dump truck containing the stone chips. To the truck is attached a special chip spreader which applies the desired amount of chips over the narrow strip of asphalt treated surface.

## Prizes from Lime Concern to Future Farmers

LADD LIME AND STONE CO., Cartersville, Ga., recently presented cash prizes aggregating $50 to winners in a contest conducted by Prof. Ralph Mobley for members of Future Farmers of America. Col. W. H. McNaughton, president, and Raymond Hoagland, vice-president, made the presentation.

## Safe Sling Practice

MACWHYTE CO., Kenosha, Wis., has prepared a booklet on safe sling practice which includes illustrations of common types of hitches, methods of computing safe loads, and the right and wrong way of applying the hitch to the load.

A sling load chart gives the sling stress at various angles of inclination, and a formula for determining the stress for any given vertical load.

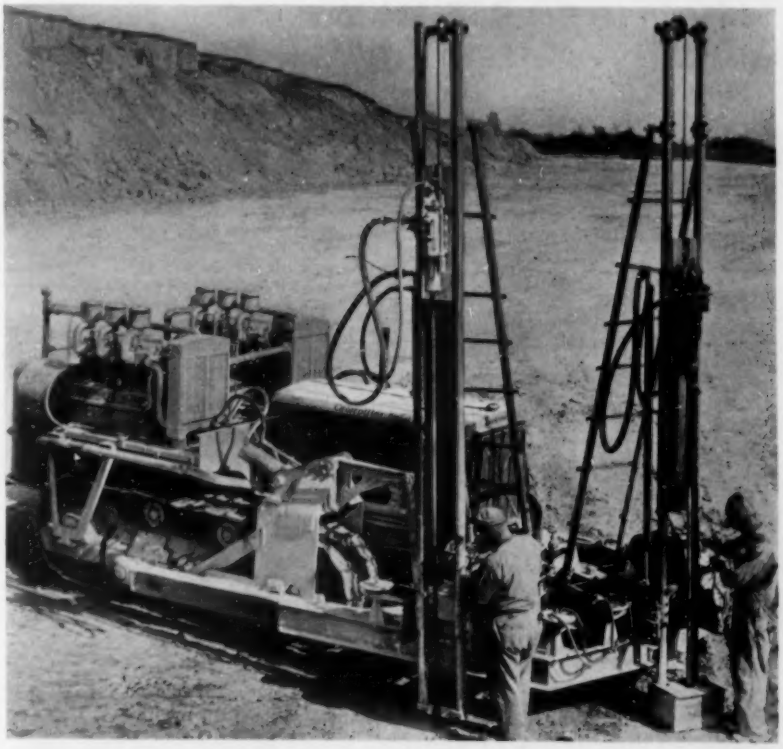
## Handbook for Highways

A POCKET REFERENCE for Highway Engineers, 1941 edition, has been issued by the Asphalt Institute, New York, N. Y. This vest-pocket size reference book of 254 pages contains many useful tabulations for the highway engineer, and is a valuable addition to the aggregates producer's library as it gives the recommended mixtures for different types of roads, airports, and walks.

## Modernize Marquette Quarry Operations

CONSTRUCTION WORK on the new mill buildings of the Marquette Cement Manufacturing Co., at the former Hawkeye plant, Des Moines, Ia., is well under way, and modernization of quarry equipment and haulage methods has been practically completed.

Among the equipment improvements is this unusual drilling set-up shown in the illustration. A Davey compressor is mounted on a Caterpillar Diesel D8, and the two wagon drills are supported from the La Plant Choate frame at the rear in such a manner that they can be swivelled into position. Note the box at the right which prevents chips and dust from striking the operator of the drill during the time when the hole is being started.



**Two wagon drills and compressor mounted on tractor give mobility to this equipment in quickly reaching any part of the quarry**

# Federal Contract Awards

FEDERAL government agencies have awarded contracts to the following companies for the period from June 9 to July 5, 1941, as reported by the Division of Public Contracts, Department of Labor:

### Cement

Southwestern Portland Cement Co., Los Angeles, Calif., War, $171,840.

Calaveras Cement Co., San Francisco, Calif., Int. Rel., $29,767.

Pacific Portland Cement Co., San Francisco, Calif., War, $27,750.

Signal Mountain Portland Cement Co., Chattanooga, Tenn., WPA, $67,288.

Universal Atlas Cement Co., Waco, Texas, WPA, $26,997.

Longhorn Portland Cement Co., San Antonio, Texas, WPA, $216,140.

San Antonio Portland Cement Co., and Longhorn Portland Cement Co., WPA, $31,607.

Union Portland Cement Co., Ogden, Utah, War, $106,800.

Nebraska Cement Co., Superior, Nebr., and Ash Grove Lime & Portland Cement Co., Louisville, Nebr., from Ready Mixed Concrete Co., Omaha, Nebr., WPA, $30,788.

Lehigh Portland Cement Co., Sandts Eddy, Penn., WPA, $11,567.

Penn-Dixie Cement Corp., Bath, Penn., from Watertown Builders Supply Co., Watertown, Mass., WPA, $91,513.

Consolidated Cement Co., Fredonia, Kans., WPA, $20,070.

Lone Star Cement Corp., Bonner Springs, Kans., from P. J. Byrne & Son, Kansas City, Kans., WPA, $20,663.

Alpha Portland Cement Co., Easton, Penn., WPA, $42,600.

Oklahoma Portland Cement Co., Ada, Okla., WPA, $23,970.

Lone Star Cement Corp., Spocari, Ala., WPA, $12,688.

Santa Cruz Portland Cement Co., San Francisco, Calif., WPA, $26,620.

*A. P. Woodson Co., Washington, D. C., D. C. Pur. Office, $36,625.

Pacific Portland Cement Co., San Francisco, Calif., Int. $33,100.

Oregon Portland Cement Co., Portland, Ore., Int., $13,750.

Alpha Portland Cement Co., Easton, Penn., Panama, $296,000.

Arkansas Portland Cement Co., Little Rock, Ark., WPA, $46,837.

U. S. Portland Cement Co., Denver, Colo., Int., $31,875.

*Winslow and Co., Portland, Me., WPA, $12,768.

Pennsylvania-Dixie Cement Corp., New York, N. Y., WPA, $15,000.

Alpha Portland Cement Co., Easton, WPA, $27,352.

Arkansas Portland Cement Co., Little Rock, Ark., WPA, $13,400.

Idaho Portland Cement Co., Inkom, Idaho, WPA, $45,562.

Keystone Portland Cement Co., Philadelphia, Penn., WPA, $23,213.

### Sand and Gravel

Dunham-Price, Inc., Lake Charles, La., WPA, $11,340.

B. Regan and C. L. Barnes, Big Spring, Texas, from Ernest Loyd, Fort Worth, Texas, WPA, $32,263.

C. L. Barnes from Ernest Loyd, Fort Worth, Texas, WPA, $21,165.

W. W. White, Ft. Sam Houston, Texas, from James Donaldson, Inc., San Antonio, Texas, WPA, $13,750.

Metropolitan Sand Co., Northport and Port Washington, L. I., N. Y., from C. B. Ames, Inc., Bronx, N. Y., WPA, $17,195.

L. E. Reel, Forest Hill, La., WPA, $30,000.

Richmond Sand & Gravel Co., Norfolk, Va., War, $10,590.

Chandler Materials Co., Tulsa, Okla., WPA, $25,510.

Ralph Giovannucci, Pittsfield, Maine, WPA, $16,250.

Ocean City Contracting Co., Inc., Ocean City, N. Y., WPA, $20,000.

H. Bairstow Co., Chicago, Ill., WPA, $24,300.

Majestic Bldg. Materials Corp., Overland, Mo., WPA, $17,320.

### Bituminous Mixtures

Warren Brothers Roads Co., Cambridge, Mass., WPA, $118,370.

The Lane Construction Corp, Meriden, Conn., WPA, $69,460.

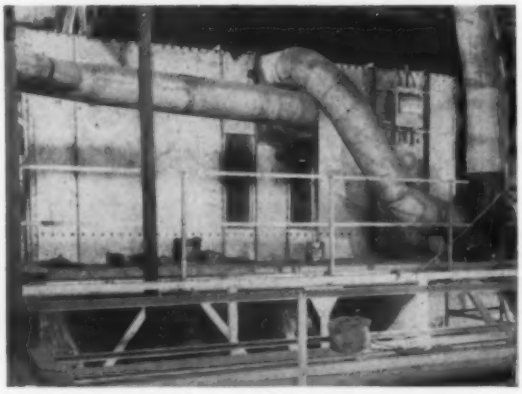
Central Supply Co., Watsonville, Calif., WPA, $66,485.

Frontier Bituminous Material Corp., Lockport, N. Y., and Buffalo Crushed Stone Corp., Buffalo, N. Y., WPA, $102,700.

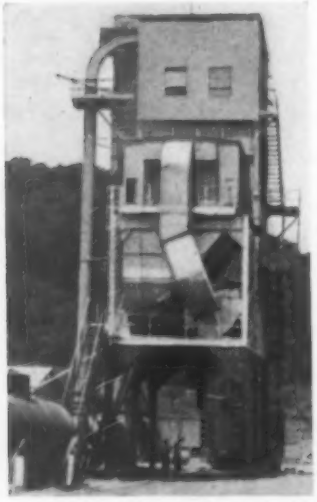
The Marble Cliff Quarries Co., Columbus, Ohio, WPA, $27,472.


PARSONS OVAL BAG Dust ARRESTORS

Stop the dust nuisance and turn it into Profit!



*Continuous Operating Oval Bag Dust Arrestor serving finish mill of Cement Plant*



*Collecting Dust at Stone Crushing Plant*

● **The fines collected from dust in rock crushing plants, cement plants, etc., HAVE A DEFINITE SALES VALUE.**

**So when you collect dust at its source you not only improve working conditions, protect the moving parts of your equipment and keep your plant clean, but can sell the collected fines at a PROFIT that will soon cover the cost of a dust arrestor installation.**

**THE PARSONS OVAL BAG DUST ARRESTOR is outstanding in performance. The OVAL BAGS stay "NEW" in filtering capacity because they will not plug, even when handling dust from moist materials, and need no replacement for an average of more than ten years. The working parts and ease, too, are sturdily constructed for long life. *Write for BULLETIN DA-6.***

**Complete Line of Dust Arrestors**

**Continuous Automatic—Oval Bag Type—Unit Type—All-Metal Parclone Centrifugal.**

*Built by*

PARSONS ENGINEERING CORP.

CLEVELAND, OHIO

THE NAME PLATE THAT MEANS QUALITY

PARSONS

Dahlgren & Brooks, Oklahoma City, Okla., WPA, $93,265.

The Leverty & Hurley Co., Bridgeport, Conn., WPA, $43,680.

Warren Brothers Roads Co., Cambridge, Mass., WPA, $143,966.

Frank S. Kapla, Hartford, Conn., WPA, $74,620.

J. R. Ford Co., Inc., Lynchburg, Va., WPA, $85,687.

F. V. Lawrence, Falmouth, Mass., WPA, $47,560.

Trimount Bituminous Products Co., Everett, Mass., WPA, $38,726.

General Crushed Stone Co., Winchester, Mass., WPA, $49,130.

Warren Bros. Roads Co., Cambridge, Mass., and Blue Stone Quarry Co., New Bedford, Mass., WPA, $59,700.

The Lane Construction Corp., Meriden, Conn., WPA, $49,490.

Central Construction Co., Roxbury Mass., WPA, $39,463.

W. L. Cobb Construction Co., Montgomery, Ala., WPA, $10,905.

Roquemore Gravel & Slag Co., Montgomery, Ala., WPA, $10,146.

### Crushed Stone

John S. Lane & Son, Inc., Meriden, Conn., WPA, $24,408.

Mario Pandolf Co., Inc., Needham Heights, Mass., WPA, $17,967.

Chandler Materials Co., Tulsa, Okla., WPA, $76,045.

Granite Rock Co., Watsonville, Calif., WPA, $33,074.

Henry J. Kaiser Co., Livermore, Calif., and Pacific Coast Aggregates, Inc., Coyote, Calif., from Melrose Building Materials Co., Oakland, Calif., WPA, $28,750.

Granite Rock Co., Watsonville, Calif., WPA, $23,100.

General Crushed Stone Co., Winchester, Mass., WPA, $13,840.

Buffalo Crushed Stone Corp., Buffalo, N. Y., WPA, $24,957.

Lyddy Bros. Farm, Kendall, Wis., from R. C. Wonn, Cobb, Wis., WPA, $34,835.

Ross Island Sand & Gravel Co., Portland, Ore., WPA, $18,882.

The Lynn Sand & Stone Co., Swampscott, Mass., WPA, $17,000.

Solvay Sales Corp., Syracuse, N. Y., WPA, $27,000.

Rock Hill Stone & Gravel Co., St. Louis, Mo., WPA, $26,460.

### Slag

* Slag and Sand.

* The Standard Slag Co., Youngstown, Ohio, and Carbon Limestone Sand Co., WPA, $11,571.

The Standard Slag Co., Youngstown, Ohio, WPA, $13,165.

The Maryland Slag Co., from The Arundel Corp., Baltimore, Md., D. C. Pur. Office, $59,650.

The Arundel Corp., Baltimore, Md., WPA, $32,820.

Colianni & Dire Co., Chicago, Ill., WPA, $16,500.

### Ready Mixed Concrete

Crystal Concrete Co., South Braintree, Mass., WPA, $16,435.

Watertown Builders Supply Co., Watertown, Mass., WPA, $16,435.

Contractors Material Co., St. Louis, Mo., WPA, $16,638.

The Moraine Gravel & Sand Co., Dayton, Ohio, War, $46,000.

A. S. Horner, Denver, Colo., WPA, $26,600.

Maloney Concrete Co., Inc., D. C. Pur. Office, $99,000.

Sheesley Supply Co., Inc., Johnstown, Penn., War, $11,464.

Ready Mixed Corp., War, $33,750.

### Concrete Pipe

Sherman Concrete Pipe Co., Tampa, Fla., War, $33,735.

Mission Concrete Pipe Co., San Antonio, Texas, $76,274.

Chandler Materials Co., Tulsa, Okla., WPA, $12,945.

Shearman Concrete Pipe Co., Montgomery, Ala., War, $16,577.

New England Concrete Pipe Co., Newton Upper Falls, Mass., War, $76,978.

Spokane Concrete Pipe Co., Spokane, Wash., War, $19,405.

Concrete Products Co. of America, Philadelphia, Penn., WPA, $17,180.

Shearman Concrete Pipe Co., Montgomery, Ala., WPA, $21,560.

Cement Products Co., Lubbock, Texas, WPA, $12,000.

Concrete Pipe Co., Twin Falls, Idaho, WPA, $10,739.

Faulkner Concrete Pipe Co., Mobile, Ala., War, $19,372.

### Agricultural Limestone, AAA
(Indefinite Amounts)

France Stone Co., Logansport, Ind., from James Hajek, Jr., North Judson, Ind.

Keeport Quarries, Logansport, Ind., from Paul Tanner, Ora, Ind.

Midwest Stone Co., Greencastle, Ind., from Otto Hunley, Spurgeon, Ind.

Louisville Cement Co., Milltown, Ind., from Otto Hunley, Spurgeon, Ind.

Mid-West Stone Co., Spencer, Ind., and Indiana State Farm, Greencastle, Ind., from Ray Deckard, Sullivan, Ind.

Forrest I. Mitchell, Delphi, Ind.

Material Service Co., Chicago, Ill.

Concrete Materials & Construction Co., Cedar Rapids, Iowa.

*(Continued on page 122)*


TIME IS THE FACTOR

DEMPSTER-DUMPSTER IS THE ANSWER

**The Army, the Navy and the Air Corps are calling on every source of supply to "Speed Up". They are using DEMPSTER-DUMPSTERS in their operations; and many of their "Feeders", including the Steel Mills, Crushed Stone Plants, Aluminum Manufacturers; Lime Quarries and Cement Plants, have standardized on the BuckeTruX to assist in the big Push to get the maximum efficiency in the production line.**

**The standard DEMPSTER-DUMPSTER handles all types of Detachable Containers; and the Units are built to service Buckets carrying net Payloads ranging from 6,000 lbs. to 12,000 lbs. net.**

**Catch up with progress.**

**Call or write for information.**

← HAULING

DUMPING →

*WRITE FOR DETAILS . .*

DEMPSTER BROTHERS, INC.

KNOXVILLE TENNESSEE

# NATIONAL ASSOCIATION ACTIVITIES

## Lime

NATIONAL LIME ASSOCIATION has called attention to the passage by the House of Representatives of S. 1800 which amends the Farm Bill, permitting the A.A.A. to buy materials without bid. It is reported that there is little interest among authorities in Washingon to use this non-bid method of purchasing liming and fertilizing materials as "too many headaches are involved." In certain states, however, notably New York, the state committee is in favor of this method.

The association's survey will show that over 13,375,000 tons of liming materials were used during 1940. Compared with 8,003,176 tons in 1939, this represents an increase of 67 percent. Of this total, 3,275,000 tons, or about one-fourth, was furnished by the A.A.A. as "grants-of-aid."

It has been announced that the Houston plant of The Haden Lime Co., Houston, Texas, has qualified as the sixth member of the Thousand Day Club, having worked 1061 days without a lost-time accident. The fifth member is the Cedar Hollow plant of the Warner Co., Philadelphia, Penn.

## Sand and Gravel

EXECUTIVE SECRETARY V. P. AHEARN of the National Sand and Gravel Association has called the attention of the membership to a statement by the Administrator of the Wage and Hour Law, Gen. Philip B. Fleming, in which he reversed his ruling in the Smoot Sand and Gravel Co. case. The stated reason for the reversal is the unanimous decision of the U. S. Circuit Court of Appeals for the Fifth Circuit, in Gale et al v. Union Bag and Paper Corporation involving an appeal from a decision of the Federal District Court for the Southern District of Georgia, dismissing an employe suit filed under section 16(b) of the law, because of a finding by the court that barge captains are "seamen" and therefore exempted. In discussing the immediate issue in the case, the Circuit Court pointed out that barge captains in question were concerned with navigation in commerce on navigable waters, but it does not appear that the court excluded other employes on navigable waters, such as dredge employes, from the coverage of the seamen exemption.

A meeting is to be held of all producers concerned to which General Fleming and Mr. Snyder, his deputy, will be invited. There was a unanimous agreement at the recent Evansville meeting that the whole industry should take an active part, through the filing by the Association of an amicus brief, in any employe suit filed under section 16 (b) which involves the status of employes in the industry working on navigable waters. Two cases of this character are now pending.

### Ruling on Barges

The Association also has requested an opinion from the Interstate Commerce Commission as to the status of the industry's equipment operating in navigable waters under the water commerce control provisions of the Transportation Act of 1940. George E. Talmage, Jr., Director of the Bureau of Water Carriers, replied to Secretary Ahearn's inquiry that private carriers handling their own materials are not subject to the Act, but if materials are handled for another company for which a charge is made and the movement is in interstate commerce, the companies come under the Act and must apply for certificates as common carriers. If a vessel is chartered or rented to another company, other than a carrier subject to the Act, the company owning such vessels becomes a contract carrier subject to the Act and must file an application to operate as a contract carrier.

## Ready Mixed Concrete

MEMBERS of the National Ready Mixed Concrete Association have reported that efforts have been made by regional offices of the Wage-and-Hour Division to enforce the law against them on the ground that their products were used in the repair or reconstruction of essential instrumentalities of interstate commerce and that therefore the law applied even though there was no physical movement of the materials in interstate commerce.

The Association has sent out a letter pointing out that employes in the ready mixed concrete industry were not covered by the law unless the materials which they produced moved across State lines, or were incorporated as ingredients of another product which moved across State lines. At the request of the Association, the Division has sent out new instructions clarifying the law and upholding the Association's contentions.

## Industrial Sand

NATIONAL INDUSTRIAL SAND ASSOCIATION was represented by its special advisory committee at a joint conference on July 9 with representatives of the Priorities Division of OPM and of the Office of Price Administration and Civilian Supplies. The main purpose of the meeting was to facilitate the obtaining of priorities and expediting the procurement of equipment and supplies for the industrial sand industry; to further emphasize the essential nature of industrial sand to the defense program; and to reconsider reports which have already been made to the National Defense Advisory Commission on anticipated car requirements and the industry capacity survey.

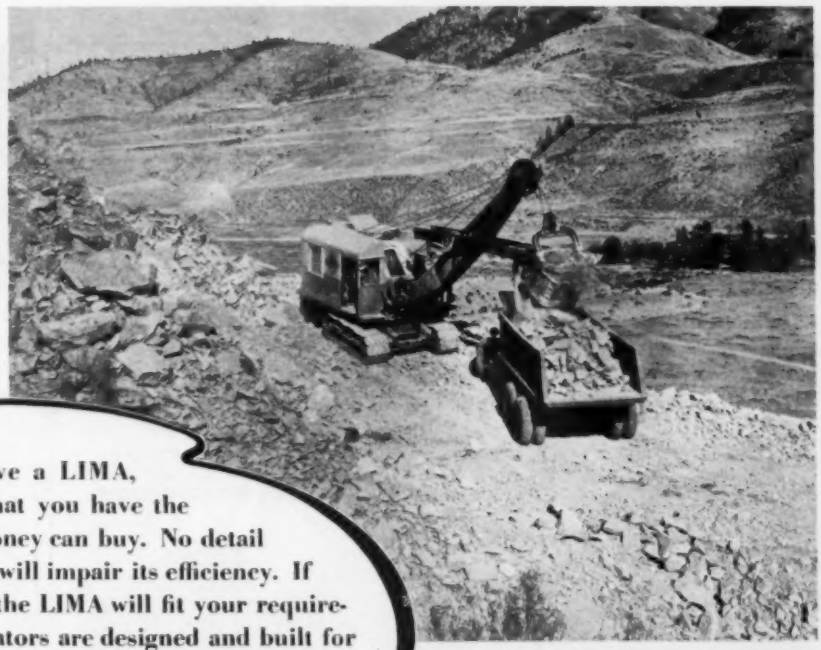
As a result of the meeting, it appears that some new regulations or authorizations will become effective soon which will simplify and expedite obtaining of needed penalties for the industry. To bring matters up-to-date, it was decided that a new survey of the industry capacity by grades of sand be made and a new estimate of car requirements by months and types of cars be made to cover the balance of the year. Member companies are being asked to list their customers on defense work, with their names and addresses, and the priority ratings covering orders from customers.

## Concrete Burial Vault 1942 Convention Plans

SECRETARY R. W. MEAD of the National Concrete Burial Vault Association has advised that at a meeting of the 1942 convention program committee in June, The Hotel Cleveland, Cleveland, Ohio was selected for headquarters and the dates are June 9, 10 and 11, 1942. There will be an exhibit which proved so popular in 1939. The committee meeting was attended by E. C. Jefferies, chairman; F. L. Mathies, past president and L. K. Huber, newly elected president. J. R. Van Meter of Cincinnati, Ohio, chairman of the National Advertising Committee, has announced that the year's advertising schedule has been decided upon.

# LIMAS

## CAN BE DEPENDED UPON TO PRODUCE BIG YARDAGE IN ROCK



When you have a LIMA, you can be sure that you have the best excavator that money can buy. No detail has been overlooked that will impair its efficiency. If your work is digging rock, the LIMA will fit your requirements exactly. LIMA excavators are designed and built for the job that requires the most in power, strength and durability. Capacities range from ¾ yards to 3½ yards. Write for bulletin covering the size that best fits your requirements.

LIMA LOCOMOTIVE WORKS, INCORPORATED
Shovel and Crane Division LIMA, OHIO, U. S. A.

# LIMA

## THERE'S NO HIDING FROM THE FACTS!

Wide awake operators using Eagle washers and dewaterers aren't hiding their heads in sand. They are finding that the best way for profitable operation is to be sure of meeting tough specification demands. Many plant operations were unable to produce highway specification paving materials until they had modernized their equipment by installing Eagle Washers and Dewaterers.

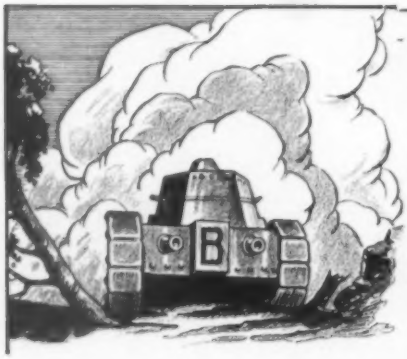
Years of experience have proved the extremely high efficiency, low operation cost, large capacity and long life of Eagle washers and dewaterers.

**Eagle makes a complete line of soundly engineered, high quality plant equipment—Spiral screw washers . . . Paddle type log washers . . . Sand tanks . . . Sand drags . . . Sand dewaterers . . . Shale removers . . . Sand and gravel crushers . . . Swintek screen nozzle ladder.**

*Let us show you how Eagle equipment will earn dividends for you.*

## EAGLE IRON WORKS

**Des Moines, Iowa**



**It's a One Man BLITZ**

. . . say engineers and contractors who have seen the LOAD LUGGER in action. It's a master of timing . . . as it hauls and dumps the material while the ground crew is filling empties . . . no idling . . . no waste motion. Simple, sturdy and speedy. One LOAD LUGGER on a standard truck chassis can operate economically with 5 to 10 detachable buckets, doing the work of several trucks.

**Brooks LOAD LUGGER**

Ask about our Special Introductory Offer.

•

*New Catalog sent on request.*

**Brooks EQUIPMENT AND MFG. CO.**

KNOXVILLE 808 Davenport Road TENNESSEE

*Distributors in all Principal Cities*



TRADE MARK
KEYSTONE
REGISTERED U. S. PATENT OFFICE

**MODEL 51**

**BLAST HOLE DRILL**

***What Blast Hole Drills Must Have***

Factors that make blast hole for a well drilling machine are *power, weight of tools, stroke adjustment* and *shock absorption.*

Skillful operation is an additional requisite that the wise quarry superintendent will not forget.

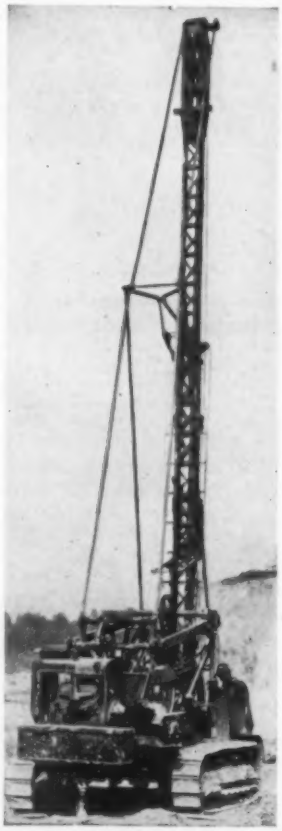
*KEYSTONE* has for long years supplied to the quarry industry the best in well drill design and manufacture. No specification of material or fabrication is permitted in our shops to fall below the best available for the purpose intended.

The merited result has been recognized achievement in this field.

*Keystone drill owners keep their Keystones.*

**KEYSTONE DRILLER CO.**

**Beaver Falls, Pa.**




## No Accidents Reported in June Safety Contest

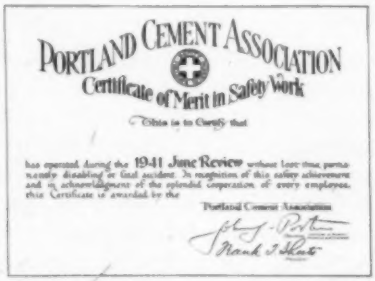
EVERY CEMENTMAN in 115 manufacturing plant organizations completed the June Safety Review, sponsored by the Portland Cement Association, without disabling injury. The Association's handsome Certificate of Merit in Safety Work, individually inscribed, has been awarded each mill which was successful in completing June without a lost-time accident.

Not one June accident occurred in the Raw Mill, Coal Grinding, Power, Shop, Railroad or Yard locations in any cement mill reporting to PCA. Quarry and Burning departments held the doubtful distinction of contributing the most accidents with 5 each. Next were Crushing and Finishing with 3 each, Cement Storage with 2, followed by Clay Field and Packing and Shipping with 1 each.

Seventeen cement mills were forced out of the "Safety Parade" by accidents which caused four deaths, two permanent injuries and 14 lost-time accidents. Three of the June fatalities, both permanent injuries and six disabling injuries were first accidents of the year in 10 of the 17 plants, continuing the reputation of June as the most hazardous month of the year in cement operations.

Victims of the fatal accidents were a crusher foreman, a crusher feeder, a repairman and an electrician. Permanently crippled were a cement stower and an electrician. Forced to lose time from work on account of injuries were two foremen, two drillers, two repairmen, two laborers, a locomotive runner, a pitman, a hammer mill operator, a crusherman and an oiler.

With mill activity about one-third greater during the first half of the year than in 1940, 45 percent more disabling injuries have been reported to the Portland Cement Association than last year.


PORTLAND CEMENT ASSOCIATION

Certificate of Merit in Safety Work

This is to Certify that

has operated during the 1941 June Review without lost-time, permanently disabling or fatal accident. In recognition of this safety achievement and in acknowledgment of the splendid cooperation of every employee, this Certificate is awarded by the

Portland Cement Association

**Certificate of Merit in safety work issued to cement plants for operating without an accident during the June campaign**

# KEEP AHEAD WITH SIMPLICITY SCREENS

The Simplicity Engineering Company has pioneered and developed many important features for the screening industry. Every new development which will improve their efficiency is adopted so that today SIMPLICITY SCREENS will grade larger tonnages with higher efficiencies than any screen of comparable size.

Large capacity, positive action, durable construction, perfect balance, freedom from blinding and rubber cushioned power make SIMPLICITY SCREENS truly the superior screen.

There is a SIMPLICITY GYRATING SCREEN for every problem requiring a separating or grading action. Write for new Bulletin No. 41.

**SIMPLICITY ENGINEERING CO.**
**DURAND, MICHIGAN**

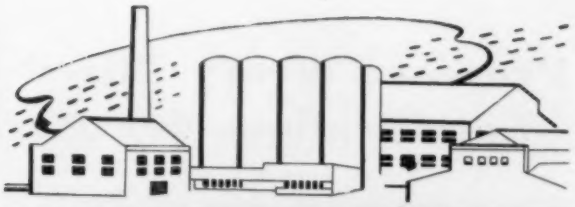
# THE PRICE *of Leadership!*

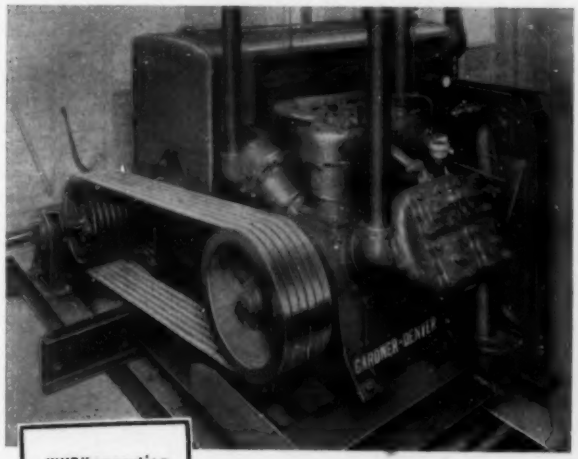
ROCK PRODUCTS leads the field in editorial excellence and prestige. It is the journal referred to by all authorities for authentic information about these industries.

ROCK PRODUCTS has paid the price of leadership. It has had only one fundamental editorial policy through the years: Its editorial policy has been, in one word, USEFULNESS to the reader.

ROCK PRODUCTS has never reduced its subscription price because it has never reduced its usefulness to the reader: and no reader has ever objected to paying $2 for this useful journal.

**ROCK PRODUCTS**
**309 West Jackson Blvd.**
**Chicago, Ill.**





*"WB" operating time: 4826 hours . . . Maintenance cost: 25 cents.*

*"WB" runs 200 hours on each oil change...We never add any oil between changes.*

*"17,520 cubic feet of air at a fuel cost of 45 cents with our 'WBH' Diesel-powered Compressor."(This figure allows for the unloaded periods.)*

# EYE-OPENING *Performance* FOR CEMENT MILLS

● These typical user reports show how. In hundreds of plants, Gardner-Denver "WB" Vertical, Two-Stage, Water-Cooled Air Compressors are creating a new conception of low maintenance and dependability.

Here's an ideal compressor for slurry agitation, filtering, and other cement mill service, with these outstanding advantages:

★ **High efficiency, comparable to large, horizontal compressors.**
★ **Low discharge temperature assured by efficient cooling.**
★ **"Air-cushioned" Duo-Plate Valves.**
★ **Force feed pressure lubrication.**
★ **Unusual compactness—requires little floor space.**
★ **Capacities from 142 to 445 cu. ft. displacement per minute.**

For full information on Gardner-Denver "WB" Air Compressors, write Gardner-Denver Company, Quincy, Illinois.

GARDNER-DENVER

*Since 1859*

# Proposed Ready Mixed Concrete Specifications for Pavements

AT THE RECENT annual convention of the American Concrete Institute the report of Committee 617 (H. F. Clemmer, chairman) was submitted for study and criticism. The complete report is published in the February issue of the *Journal of the American Concrete Institute* and comments and criticisms from interested parties may be sent to the secretary of the Institute up to June 1 (Harvey Whipple, 7400 Second Blvd., Detroit, Mich.

### Central Mixing Plant

The central mixer drum shall be of adequate size to accommodate the maximum batch, and shall be in accordance with the Concrete Mixer Standards adopted by the Mixer Manufacturers' Bureau of the Associated General Contractors of America. It shall be capable of combining the aggregates, cement, and water within specified time into a thoroughly mixed and uniform mass, and of discharging the mixture without segregation. The mixer shall be rotated at the rate recommended by its manufacturer. Provision shall be made at the mixer to insure that the concrete is not discharged until the specified mixing time has elapsed. The mixing time shall be measured from the time that all materials, exclusive of mixing water, are in the mixer drum. When the central mixing plant is used for the complete mixing of concrete to be transported in an agitator truck, the minimum mixing time for mixers of one cubic yard capacity or less shall be not less than one minute; for mixers of larger capacities this mixing time shall be increased at the rate of fifteen seconds or more for each cubic yard, or fraction thereof, additional capacity. When the central mixing plant is used for the complete mixing of concrete to be transported in a non-agitating truck, the minimum mixing time for mixers of one cubic yard capacity or less shall not be less than one minute; for mixers of larger capacities this mixing time shall be increased at the rate of 30 seconds or more for each cubic yard, or fraction thereof, additional capacity.

### Truck Mixers and Agitators

(1) *General (a)* The requirements for operating truck mixers and agitators covered herein are based on recommendations of the National Ready Mixed Concrete Association. These recommendations are based on equipment manufactured by companies holding certificates from the Association. The Association considers equipment only with regard to its ability to mix and/or transport concrete in an acceptable manner from the point of view of quality. The Standards Committee of the N. R. M. C. Assn. will study such data as manufacturers may present, and advise as to the data required, to determine under what limiting conditions as to capacity, mixing time, etc., their equipment should be operated, and will issue a certificate in that regard.

*(b)* These standards and recommended practices are subject to periodic revision as further studies justify such revision.

(2) *Definitions (a)* The two types of truck mixers and agitators covered herein are the following: (A) a closed or water-tight revolving drum suitably mounted and fitted with adequate blades attached to the drum; (B) an open-top water-tight trough-like container suitably mounted and fitted with adequate blades, revolving about an axis parallel to the axis of the trough.

*(b)* The truck mixers are capable of combining aggregates, cement and water into a thoroughly mixed and uniform mass of concrete and of discharging the mixture with a minimum of segregation. The truck agitators are capable of transporting and discharging concrete with a minimum of segregation.

*(c)* Truck mixing is the process of combining the aggregates, cement and water into a thoroughly mixed and uniform mass of concrete, in a truck mixer.

*(d)* Shrink-mixing is the process of completing, while in transit to destination, the mixing of concrete which has been partially mixed in a stationary mixer the minimum amount of time required to incorporate the ingredients into a mass. (Note: About 30 seconds.)


ANOTHER KERN PLANT

Southern Ohio Quarries Co. Choose the Kern Radial Storage System to Assure Low Cost Storage and Reclaiming All Year Round

**Kern designed plants are flexible and make it easy to supply a variety of specification grades.**

FRED T. KERN CO.

P. O. Box 2057 . . . . . Milwaukee, Wis.

*(e)* Agitating is the process of slowly mixing to prevent segregation in a truck mixer or a truck agitator while in transit to destination, concrete which has already been mixed in a stationary mixer.

(3) *Capacities (a)* When used for truck mixing, the capacity of truck mixers shall be in accordance with the manufacturer's rating but the volume of mixed concrete shall not exceed 57½ percent of the gross volume* of the drum or container.

*(b)* When used for shrink-mixing, the capacity of truck mixers shall be in accordance with the manufacturer's rating but the volume of mixed concrete shall not exceed 70 percent of the gross volume* of the drum or container.

*(c)* When used for agitating, the capacity of the truck mixer or of the truck agitator shall be in accordance with the manufacturer's rating but the volume of mixed concrete shall not exceed 80 percent of the gross volume* of the drum or container.

*(d)* The manufacturer shall attach to each truck mixer and truck agitator a metal plate on which is stated the capacities, in terms of volume of mixed concrete, for the various uses to which the equipment is applicable. When capacities less than the limits indicated herein are shown on the metal plate it indicates the maximum capacities for which the equipment was designed to be operated under the conditions stated by the manufacturer, and such capacities shall govern.

(4) *Mixing Speeds (a)* Mixing speed for the revolving drum type of truck mixer shall be not less than four revolutions per minute of the drum nor greater than a speed resulting in a peripheral velocity of the drum of two hundred twenty-five feet per minute. For the revolving blade type of mixer, mixing speeds shall not be less than six nor more than 16 revolutions per minute of the blades.

*(b)* Agitating speed, for both the revolving drum and revolving blade types, shall be not less than two nor more than six revolutions per minute of the drum or of the mixing blades.

(5) *Mixing Time (a)* For truck mixers into which the *fine and coarse aggregates are charged simultaneously*, not less than 40 revolutions of the drum or blades at mixing speed shall be required after all of the ingredients including water are in the drum. (Note: Cement and water may be charged separately.)

*(b)* For truck mixers into which the *fine and coarse aggregates are charged separately*, not less than 60 revolutions of the drum or blades at mixing speed shall be required after all of the ingredients including the water are in the drum.

*(c)* For shrink-mixing, not less than 40 revolutions of the truck mixer drum or blades at mixing speeds shall be required.

*(d)* For truck mixing and shrink-mixing, not more than 150 revolutions of the drum or blades shall be at a speed in excess of that specified in Section 4 *(b)* as agitating speed. Additional mixing shall be at agitator speed.

*(e)* When means for verifying the mixing time is required, one of the following devices shall be employed:

(1) A batch meter and locking device mounted on the truck mixer capable of preventing the discharge of the mixer prior to the completion of the required number of revolutions.

(2) A counter mounted on the truck mixer permitting of reading the revolution count at the proportioning plant and at destination.

*(Continued on page 122)*

* For the open-top mixer, the gross volume on which rated capacities are based shall be calculated on the basis that the vertical dimensions of the container above the central shaft shall not exceed the radius of the circular section below the central shaft.

The above screening plant turns out 400 tons of graded aggregate per day and is kept supplied with raw material from a gravel bar by a ¾-cu. yd. Sauerman Slackline Cableway.

**SAUERMAN efficiency means greater economy and higher PROFITS!**

Excavating and stockpiling is simplified by using a SAUERMAN Drag Scraper or Cableway.

These machines dig, haul and dump in one economical straight-line operation. Readily adaptable to varying digging conditions, they will move a given yardage in less time than any other machines of comparable price.

Because they require but a single operator, consume little power in operation, and require practically no maintenance, they are extremely profitable to use.

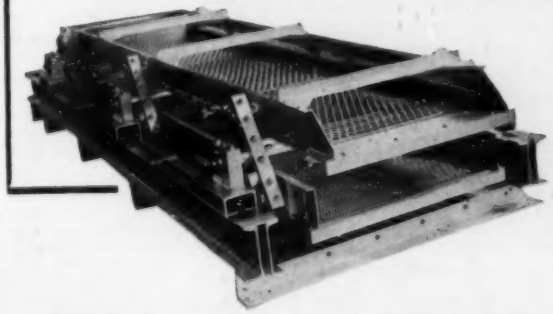
*Write for Catalog.*

*This shows Sauerman Drag Scraper handling open storage of phosphate rock at large drying plant.*

**SAUERMAN BROS., Inc.**
**430 S. Clinton St. CHICAGO**

**Sauerman LONG RANGE MACHINES**

**THE *Only* SCREEN**
**That Shakes As It Whips**



HERE is the ideal screen for sizing and dewatering—the only screen with two distinct actions . . . shaking and whipping. Operates in a level or uphill position. Perfectly balanced . . . no vibration.

Write for illustrated booklet describing all the advantages of this new screen.

**HENDRICK MANUFACTURING CO.**
47 Dundaff St., Carbondale, Pa.
SALES OFFICES IN PRINCIPAL CITIES
PLEASE CONSULT TELEPHONE DIRECTORY

Makers of Elevator Buckets of all types, Mitco Open Steel Flooring, Mitco Shur-Site Treads and Mitco Armorgrids. Light and Heavy Steel Plate Construction.

# FINANCIAL NOTES

RECENT DIVIDENDS ANNOUNCED

| | | |
|---|---|---|
| Lehigh Portland Cem. Co. pfd. | $1.00 | Oct. 1 |
| Medusa Portland Cem. | .50 | July 1 |
| Medusa Portland Cem. pfd. | 1.50 | July 1 |
| Missouri P. C. com. | .50 | June 30 |
| N. Y. Trap Rock Corp. $7 pfd. | 1.75 | July 1 |
| Northwestern States P. C. com. | .40 | July 1 |
| Com. ext. | .40 | Oct. 1 |
| Pacific Portland Cem. Co. 6% cum. pfd. $100 par value | 1.00 | July 29 |
| Riverside Cement Co. pfd. | 1.50 | Aug. 1 |
| Schumacher Wall Board pfd. | 3.50 | Aug. 15 |
| Superior Portland Cem. (arrears) | .50 | Aug. 1 |
| Santa Cruz Portland Cement Co. | .50 | July 1 |

•

PENNSYLVANIA-DIXIE CEMENT CORP., New York, N. Y., and subsidiaries reported for the 12 months ended June 30 a net profit of $1,057,178 after federal income and excess profits taxes, equal to 52c a share on 400,000 shares of common stock, after the periods' dividend requirements on 121,200 shares of $7 dividend convertible preferred stock on which accumulations amounted to about $80 a share. Profit was $583,655 for the 12 months ended June 30, 1940, before federal income taxes.

COLUMBIA QUARRY CO., St. Louis, Mo., has offered holders of its $100,000 7 percent bonds a choice of cash for them or an exchange for new 5 percent bonds. Present bondholders were also offered the right to subscribe for additional bonds if they are available.

CONSOLIDATED SAND AND GRAVEL, LTD., Toronto, Ont., Canada, presented the following income account for the years ended March 31:

| | 1941 | 1940 |
|---|---|---|
| Operating profit | $144,420 | $58,191 |
| Depreciation & depletion | 72,234 | 53,131 |
| Net oper. profit | 72,186 | 5,060 |
| Other income | 7,744 | 7,590 |
| Total income | 79,930 | 12,650 |
| Income taxes | 42,936* | 3,000 |
| Net income | 36,994 | 9,650 |
| Preferred dividends | 34,444 | ..... |
| Surplus for year | 2,550 | 9,650 |
| Earn. surplus, 4-1 | 9,946 | 296 |
| Earn. surplus, 3-31 | 12,496 | 9,946 |
| Times pfd. dividends | 0.73 | 0.19 |
| Earn., pfd. share | $5.12 | $1.31 |
| No. of pfd. shares | 7,229 | 7,354 |

*Includes excess profits tax.

•

SCHUMACHER WALL BOARD CORP., Los Angeles, Calif., established new high records in earnings and sales in the fiscal year ended April 30, 1940. The company shows a net profit of $283,285 after all charges, including depreciation, depletion, amortization, interest and provision for federal income and excess profits taxes, equal to $9.95 a share on 28,460 shares of preferred stock outstanding on which dividends in arrears totaled $6.50 a share as of May 15, last. This compares with a net profit of $100,284 for the preceding fiscal year or $3.53 a preferred share. Net profit for the fiscal year ended April 30, 1940, was after giving effect to a write-off of $107,572 representing extraordinary and non-recurring loss from the abandonment of buildings and obsolete machinery at an old plant.

The following is the income account for the years ended April 30:

| | 1941 | 1940 |
|---|---|---|
| Gross profits | $651,867 | $402,616 |
| Selling, etc., expenses | 208,956 | 185,792 |
| *Oper. profit | 442,911 | 216,824 |
| Other income | 970 | 2,204 |
| Total income | 443,881 | 219,028 |
| Other charges | 43,377 | 107,572 |
| Federal income tax | 117,219 | 11,172 |
| Net profit | 283,285 | 100,284 |

*After depreciation: 1941, $54,696; 1940, $57,726.

•

COPLAY CEMENT MANUFACTURING CO., Coplay, Penn., reported the following income statement for the years ended December 31:

| Dec. 31: | 1940 | 1939 |
|---|---|---|
| Operating income | $170,543 | $197,920 |
| Depreciation and depletion | 99,127 | 98,572 |
| Balance | 71,416 | 99,348 |
| Interest and amortization | 16,422 | 18,090 |
| State & Fed. tax | 32,232 | 33,335 |
| Bad debts | 2,988 | 12,047 |
| Surplus for year | 19,773 | 35,876 |
| Earn. surplus, 1-1 | 194,487 | 158,611 |
| Earn. surp., 12-31 | 214,260 | 194,487 |
| Times chgs. earn.: | | |
| Before taxes | 4.17 | 4.83 |
| After taxes | 2.20 | 2.98 |
| Times pfd. divs. | 0.34 | 0.61 |
| Earn., pfd. share | $2.01 | $3.65 |
| No. of pfd. shares | 9,827 | 9,827 |

•

NEW YORK TRAP ROCK CORP., New York, N. Y., had net sales of $2,863,025 for the year ended December 31, 1940, as compared to $4,315,994 the previous year, according to a report to the SEC. Cost of sales was listed at $1,520,866 as compared to $2,604,909 the year before and 1940 gross profit was $1,342,159 compared to $1,531,085 in 1939. Figures for net sales were after freight, towing and handling, allowances and discounts: 1940, $1,069,447; 1939, $1,196,180.

•

LONE STAR CEMENT CORP., New York, N. Y., presented the following income statement for the first quarter of 1941 to March 31:

| | 1941 | 1940 |
|---|---|---|
| Sales | $6,225,039 | $4,230,105 |
| Cost and expenses | 4,087,977 | 2,845,304 |
| Depreciation and depletion | 665,358 | 553,376 |
| Doubtful accounts, etc. | 146,643 | 116,583 |
| Operating profit | 1,325,061 | 714,842 |
| Other income | 86,819 | 59,487 |
| Total income | 1,411,880 | 774,329 |
| Federal income tax, etc. | ①556,883 | 220,774 |
| Net profit | 854,997 | 553,555 |

① Includes excess profits tax.

•

BASIC REFRACTORIES, INC., Cleveland, Ohio (formerly Basic Dolomite, Inc.), may have a net profit of about $130,000 for the quarter ending June 30, equal to 37c a share on the common stock, according to an estimate of Dow-Jones based on present indications and after normal and excess profit taxes at prevailing rates. Net sales for the first five months totaled $1,665,000, an increase of 76 percent over the $927,700 in the corresponding period a year ago.

## Sells Pumice Plant

BARNSBALL TRIPOLI CO., Seneca, Mo., subsidiary of the Barnsdall Oil Co., has sold its pumice mill at Grants, N. M., to McAleer Manufacturing Co., Detroit, Mich., and Whittaker, Clark and Daniels, New York.

## Claim Damages from Dust

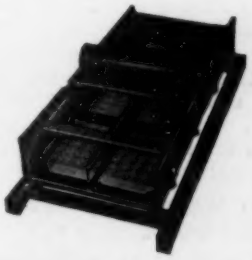
SIGNAL MOUNTAIN PORTLAND CEMENT CO., Chattanooga, Tenn., has been named in two $5000 damage suits by local residents for alleged property damage as a result of dust from the cement plant. One of the plaintiffs, according to newspaper reports, has claimed that the company has dust collection equipment on the grounds but has not installed it in order to keep the plant running continuously.

## Five Cars of Cement Daily for Caddoa Dam

COLORADO PORTLAND CEMENT CO., Portland, Colo., has been shipping about five carloads of portland cement a day to the $14,000,000 Caddoa dam project since March, 1941, representing half the daily production of the plant. At least two years will be required to fill the needs for the construction. Caddoa dam is a government project being built on the Arkansas river between Las Animas and Lamar.

## *Go ahead — Go fishin' if you want to*

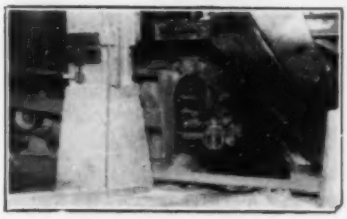
As long as you have UNIVERSAL VIBRATORS handling your screening job, the Plant will get along all right. They'll keep on making money for you while you're away. That's one thing about UNIVERSALS—you don't have to worry about them at all, they'll Keep A'Running.



**UNIVERSAL VIBRATING SCREEN CO.**
RACINE - - WISCONSIN

*Write today!*

## Do you want to crush more rock faster, cheaper, better?



### KUE-KEN CRUSHER DOES JUST THAT!

*Here's proof for you!* Time after Time the Kue-Ken Balanced crusher has more than "earned its salt" with sensational on-the-job performance. For example: one owner required over 30 hours to crush a 55 ton carload of rock *with his previous equipment.* This operator installed a Kue-Ken No. 30 Crusher, and *now does exactly the same job in only five hours!* Think of it! . . . this man can now crush six carloads of rock in the same time it formerly took him to crush one.

The Kue-Ken uses only 16 HP compared to the 15 HP his old crusher used. This "speed-up" is money in the pocket . . . money saved by faster, thereby cheaper crushing!

Reports are coming in steadily about the tremendous savings being made with Kue-Ken Crushers. This new better principle of crushing rock has proven itself on-the-job even better than was claimed. Savings made by the Kue-Ken crusher mean important NEW profits to you!

You owe it to yourself (or your firm) to get full information immediately. Case histories of Kue-Ken performance prove all these claims.

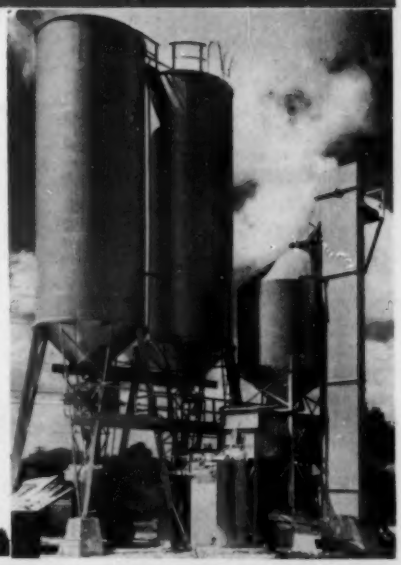
***WRITE FOR COMPLETE DETAILS! ASK FOR BULLETIN NO. 601. There's no obligation***

**STRAUB MFG. CO.**
534 Chestnut Street, Oakland, California

## The BROOKS-TAYLOR Lime Putty Plant

### IN HOUSTON

**. . . provides a means of producing and handling aged lime putty in accordance with the Brooks-Taylor process, two important features of which are the slaking of lime under thermal control and the use of patented filters to remove excess water from the putty during the ageing process. Ready mixed brick mortar made with aged lime putty is convenient, economical and of superior quality. Write nearest office for information.**



**CHICAGO BRIDGE & IRON COMPANY**

Chicago.....2452 McCormick Bldg.
New York.3396-165 Broadway Bldg.
Cleveland.Builder's Exchange Bldg.
Birmingham.....1505 N. 50th Street
Houston.....5621 Clinton Drive
San Francisco.....1093 Rialto Bldg.

## BUCKETS READY FOR IMMEDIATE DELIVERY . . .

**Speed up your material handling with a new Industrial Brownhoist clamshell bucket. All standard types ready for immediate shipment (photo shows a small part of our large stock). Quantity production plus our manufacturer-direct-to-you sales policy lowers your bucket investment. Write today.**

**INDUSTRIAL BROWNHOIST** BAY CITY, MICHIGAN • DISTRICT OFFICES: NEW YORK, PHILADELPHIA, PITTSBURGH, CLEVELAND, CHICAGO

## Proposed Ready Mixed Concrete Specifications

*(Continued from page 119)*

(6) *Time of Hauling.* Concrete shall be delivered to the site of the work, and discharged from the truck mixer or truck agitator completed within one and one-half hours (see note) after the cement comes in contact with the mixing water, or with aggregates which are surface wet.

(7) *Water Measurement (a)* For truck mixers, a water measuring device shall be provided to measure accurately the quantity of water for each batch. The device may be mounted on the truck mixer or located at the point of loading the truck mixer. It shall permit of ready access and of ready determination of the amount of water used.

*(b)* When wash water is used as a portion of the mixing water for succeeding batches, it shall be accurately measured and taken into account in determining the amount of additional mixing water required.

NOTE—Results of research have shown that one and one-half hours between the introduction of mixing water and the completion of the discharge of the batch results in no detrimental effects on the concrete. The data indicate that under specially favorable conditions periods up to two and three hours may be allowed. When air temperatures are unusually high or the ingredients of the concrete mixture are such that an unusually quick time of set or loss of plasticity may occur, it may be necessary to specify shorter periods to insure that no damage be done to the concrete; under these circumstances an investigation, satisfactory to the Engineer, with the materials to be used and in the proposed proportions, should be conducted to determine if a shorter period is necessary. It is unlikely that, under any circumstances, it will be necessary to substitute a period of less than 1 hour for the 1½ hours applicable to normal conditions.

## Reflecting Curb

SEVERAL STATES have designed and are now using a concrete reflecting curb as a border for center safety islands on divided roadways and for other safety uses. The New Jersey State Highway Commission has designed a curbing which rises in a gradual slant from the road surface to a height of 7-in., and is "ribbed" with elevated faces which reflect automobile headlight beams. These faces are comparatively close together so that a continuous band of reflected light is presented to the driver's view, providing an effective guide for night driving. This ribbed curbing is said to be particularly valuable in rainy or foggy weather. The increasing effectiveness of this curb on rainy nights is attributed to the fact that, while the film of water flowing over the reflecting faces cuts the angle of diffusion to a narrow range, it also increases the intensity of reflection.

Concrete products manufacturers in the East have obtained some very satisfactory business from the production of precast concrete curb units. Although the cast-in-place type of curbing also is used, the precast type is preferred because the surfaces are more smooth and dense and because the angle of the reflecting faces is absolutely controlled by the mold. A mold cannot be used in the cast-in-place method, and it is necessary to form the reflecting faces by hand, which does not produce the desired surface density, smoothness and accuracy.

## Federal Contract Awards

*(Continued from page 113)*

E. L. Warner, Ottawa, Kans.

T. D. Goutney, Galena, Mo.

Oscar Case, Richmond, Mo.

Screven Lime Co., Sylvania, Ga.

France Stone Co., Logansport, Ind., Thornton Quarries, Thornton, Ill., and Stearns Lime Co., Chicago, Ill., from Gus Verkler, Walkerton, Ind.

Norbert Neuheisel, Eau Claire, Wis.

Dixon Construction Co., Centerville, Iowa.

McDonald Lime Co., Pineville, Mo.

Erwin Lanning, Marion, Iowa.


# To help SOLVE YOUR DRIVE PROBLEMS

Bradley Hercules mill driven by Jones speed increaser from synchronous motor.

Jones double herringbone reducer on kiln drive in cement plant.

Jones double herringbone reducer cement mill elevator head shaft drive.

WHEN you have a drive problem that calls for a speed reducer, don't overlook Jones. All that we ask is an opportunity to present the features of Jones Speed Reducers and other transmission products that have caused them to be selected for so many applications in rock product plants. The accompanying illustrations are typical of the Jones drives that are to be found in cement plants.

Before you decide on your next speed reducers, we shall appreciate the opportunity of assisting you in the selection of drives to meet your specific requirements.

W. A. JONES FOUNDRY & MACHINE CO.

4447 Roosevelt Road, Chicago, Ill.

ANY, OR ALL, OF THESE JONES CATALOGS WILL BE SENT ON REQUEST

No. 70—Jones Herringbone Speed Reducers
No. 71—Jones Cut and Molded Tooth Gears
No. 75—Jones Worm Helical Speed Reducers
No. 55—Jones Spur Gear Speed Reducer Units
No. 68—Jones Worm Gear Speed Reducers
No. 60—Jones Lemley Friction Clutches
No. 58B and 78—Jones V-Belt Sheaves
No. 78—Jones Flexible Couplings (4 pages)
No. 56—Jones Roller Bearing Pillow Blocks
No. 69A—Jones Cast Iron Pulleys
No. 61—Jones Power Transmission Equipment

Jones
HERRINGBONE • WORM • SPUR GEAR SPEED REDUCERS
CUT AND MOLDED TOOTH GEARS • V BELT SHEAVES
ANTI-FRICTION PILLOW BLOCKS • PULLEYS
FRICTION CLUTCHES • TRANSMISSION APPLIANCES

# NEW EQUIPMENT means LOWER COST DIGGING!

Why cling to that old shovel? Why rob your profits to pay repair bills? The exclusive rolled alloy steel construction of P&H excavators means more dependability, greater production—and extra strength to resist the wear and tear of year-after-year operation.

Ask also about P&H's new hydraulic control. It's simpler, more positive and as smooth as steam!

*Capacities from ⅜ to 5 cu. yds. Gasoline, Diesel, electric power. Literature available on all models.*

*General Offices:* 4465 W. National Avenue, Milwaukee, Wisconsin.

**HARNISCHFEGER CORPORATION**

EXCAVATORS • ELECTRIC CRANES • ARC WELDERS P&H HOISTS • WELDING ELECTRODES • MOTORS

# These Screens are No "Sissies"

• In Florida at a big phosphate recovery plant where hard screening jobs are plentiful, Link-Belt vibrating screens (illustrated), are giving outstanding results in dewatering and sizing pebble phosphate. They have proved their ability to give trouble-free service.

Whether your screening job is complex or simple, be sure to call in Link-Belt. Years of screening experience and engineering counsel assure successful installations. Write today for complete literature on Link-Belt screens.

**LINK-BELT COMPANY,** Philadelphia, Chicago, Indianapolis, Atlanta, Dallas, San Francisco, Toronto. Offices and warehouses located in principal cities. 8139

**LINK-BELT**
*Vibrating* **SCREENS**

*(Pronounced COLE'-MON-OY)*

**Keep Your Machinery on the job with COLMONOY**

You can't operate 24 hours a day and stop for many repairs. Use COLMONOY to hard-surface such wearing parts as conveyor screws, pulverizing hammers, gudgeons, clinker plows, crusher teeth, feeder sprockets and all other parts subject to excessive abrasion. Easy to apply. There's a grade for every hard-facing need.

**WRITE FOR CATALOG**

**Full information on the various grades of COLMONOY for every hard surfacing requirement.**

**WALL-COLMONOY CORP.**

**Sixth Floor, Buhl Bldg., Detroit, Mich.**

558 W. 54th St. NEW YORK
625 W. Jackson Blvd. CHICAGO
208 Midco Building TULSA
21 Seneca St. Blasdell, N. Y.
123 W. Philadelphia St. WHITTIER, CALIF.

**COLMONOY**
*Hard Surfacing Alloys and Overlay Metals*

**TOUGH STUFF**
***MAKES AN***
**AMERICAN CRUSHER**

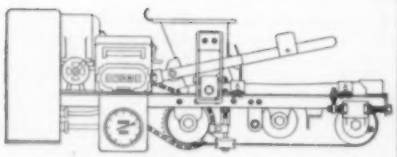
**Those American Crushers are BUILT to deliver the finished product at low cost per ton. Manganese steel rings strike the stone in suspension and shatter and distribute it before it reaches the breaker and grinding plates. A heavy alloy steel shaft gives them their powerful drive, and SKF spherical roller bearings assure their smooth performance.**

***WRITE TODAY FOR DETAILED INFORMATION***

**AMERICAN PULVERIZER CO.**
1245 MACKLIND AVE. ST. LOUIS, MO.

HARDINGE
CONSTANT WEIGHT
FEEDER

Made in 4 sizes.
Capacities 1 lb. to
650 tons per hour



Bulletin 33-C

HARDINGE
COMPANY, INCORPORATED - YORK, PENNSYLVANIA
NEW YORK, CHICAGO, SAN FRANCISCO, TORONTO

# Sand and Gravel Safety Contest Winners Announced

Two Memphis, Tenn., sand and gravel plants were winners of the National Sand and Gravel Association Safety Contest conducted by the Bureau of Mines. The bronze trophies, provided by ROCK PRODUCTS, were awarded to the Wolf River wet-pit-and-lake plant, operated by the Marquette Cement Mfg. Co., for winning in the group that worked 100,000-man-hours in 1940 without a disabling injury, and to the Chelsea lake-plant, operated by the Missouri Portland Cement Co., as the winner in the group that worked less than 100,000 man-hours. This plant worked 90,083 man-hours during 1940 without a disabling injury.

Of the 78 plants enrolled, 44 were operated without a disabling injury. One plant in the "large" group and 41 plants in the "small" group were awarded certificates of merit for having perfect safety records.

The companies and their accident-free plants receiving certificates of merit are as follows:

Industrial Silica Corporation, Garettsville and Geauga Lake, Ohio, and Utica, Penn., plants.

Firned Sand & Gravel Co., Inc., Petersburg, Va.

Dixie Sand & Gravel Corp., Chattanooga, Tenn.

American Aggregates Corp., Massillon, and Fort Jefferson, Ohio, and Kalamazoo, Mich.

Ft. Worth Sand & Gravel Co., Hurst, Texas.

Lyman-Richey Sand & Gravel Corp., Louisville, Fremont, (2) Plattsmouth, Valley, Columbus, Bridgeport, and Central City, Nebr.

Lake Sand Corp., Chicago, Ill.

Graham Brothers, Inc., Orange and El Monte, Calif.

Ideal Sand & Gravel Co., Mason City, Iowa.

Consolidated Rock Products Co., Riverside county and Monrovia, Calif., plants.

L. G. Everist, Inc., Hawarden, Iowa.

The River Sand Co., Steubenville, Ohio.

Blue River Sand & Gravel Co., Irving, Kans.

Sangravel Co., Inc., Paducah, Ky.

Massillon Washed Gravel Co., Navarre, Ohio.

Stewart Sand & Material Co., Kansas City, Mo., and Turner, Kans., plants.

Portland Sand & Gravel Co., Portland, Penn.

Erie Sand & Gravel Co., Erie, Penn.

The Cleveland Builders Supply Co., Garfield Heights, Ohio.

Edgerton Sand & Gravel Co., Edgerton, Wis.

Eastern Rock Products, Inc., Boonville, Frankfort, and Barneveld, N. Y., plants.

J. F. Thorpe Co., Delavan, Wis.

Schmidt Bros. Sand & Supply Co., Garfield Heights, Ohio.

Steiners Washed Sand & Gravel Co., Ludlow Falls, Ohio.

Gatesville Gravel Co., Gatesville, Miss.

Laval Sand Co., Fort Gay, W. Va.

## Sand-Lime Brick Production and Shipments

EIGHT active sand-lime block and brick plants reported for June and eight for May, statistics for which were published in July.

AVERAGE PRICE FOR MAY

| | | |
|---|---|---|
| Detroit, Mich. | .... | $16.00 |
| Grand Rapids, Mich. | .... | 14.00 |
| Mishawaka, Ind. | $12.00 | 13.75 |
| Saginaw, Mich. | 11.00 | .... |
| Sebewaing, Mich. | 10.50 | .... |
| Syracuse, N. Y. | 14.00 | 16.00C/L<br>20.00L/C |

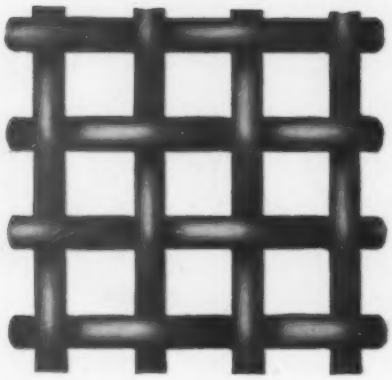
STATISTICS FOR MAY AND JUNE

| | *May | **June |
|---|---|---|
| Production | 3,121,700 | 2,067,875 |
| Shipments (rail) | 607,000 | 72,500 |
| Production (truck) | 2,076,252 | 1,916,213 |
| Stock on Hand | 1,956,369 | 1,674,567 |
| Unfilled Orders | 1,761,000 | 775,000 |

* Eight plants reporting: incomplete, two not reporting stock on hand and two not reporting unfilled orders.

** Seven plants reporting: incomplete, one not reporting stock on hand and three not reporting unfilled orders.

ROEBLING
ABRASO
SCREEN
TRADE JERSEY



ROEBLING STEEL
Assures Long Life

Roebling "Abraso" Screening is made of special steel—manufactured by *custom methods* in Roebling's own mill. It is steel that offers maximum resistance to the BEATING of stone and gravel.

To further assure long screening life, Roebling controls every step of manufacture from steel making to fabrication.

Roebling "Abraso" Screening is available for every sizing, cleaning and grading service.

JOHN A ROEBLING'S SONS COMPANY
TRENTON NEW JERSEY

Branches in Principal Cities Export Division: 19 Rector St., New York, N.Y., U.S.A. Cable Address: "Roebling's", New York

## A LIMESTONE PRODUCER *Wrote Us...*

"In August of last year, we equipped five (5) trucks with Mammoth Spreader Boxes; this was done to test the efficiency of these boxes; we found that they operated with 100% satisfaction, due mostly to the sturdy construction, which enabled them to stand up under the most severe spreading conditions."

In the same letter the producer ordered five additional Mammoth Spreaders.

Let us send you without obligation complete details about the consistently high performance and good operating profit of Baughman Spreaders.

**BAUGHMAN MANUFACTURING CO.**

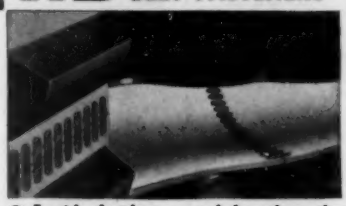
*Specializing in Spreading Equipment*

JERSEYVILLE, ILL.

---

## Keep your conveyor belts going with FLEXCO HD BELT FASTENERS

• **FLEXCO H D RIP PLATES** are used in repairing rips and patching conveyor belts. The wide space between outer bolts gives the fastener a long grip on the edges of the rip, while the center bolt prevents the fasteners from bulging.



• Avoid shutdowns and lengthen the life of your conveyor belts and bucket elevator belts by using Flexco HD belt fasteners and rip plates. Thousands of companies have stepped up the performance of conveyor lines and cut costs by using Flexco methods.

• **FLEXCO H D BELT FASTENERS** make a strong, tight butt joint with long life. Recessed plates embed in belt, compress belt ends and prevent ply separation. Six sizes in steel and alloys.

Bulletin F-100 shows exactly how to make tight butt joints in conveyor belts with Flexco HD Belt Fasteners. Also illustrates step by step the latest practice in repairing rips and putting in patches.

**FLEXIBLE STEEL LACING COMPANY**
4684 Lexington St., Chicago

Write for your copy

**FLEXCO HD BELT FASTENERS**
Sold by supply houses everywhere

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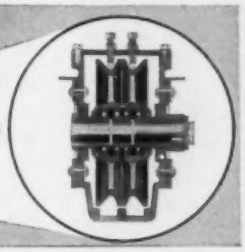
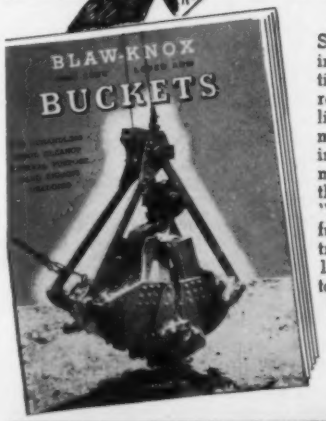
## BLAW-KNOX BUCKETS have SEALED BALL BEARING SHEAVES






Sealed ball bearing sheaves in the lever arm reduce lost time and expense of bearing replacement, increase cable life and reduce friction, materially improving operating efficiency. This, and many other better features, that make BLAW-KNOX the "wise" buy in buckets are fully explained and illustrated in NEW CATALOG 1757. Send for your copy today.

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of Blaw-Knox Company
Farmers Bank Bldg.
Pittsburgh, Pa.

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BLAW-KNOX DINE AND BATCHERS • ROAD FORMS • STREET FORMS • CONCRETE SPREADERS • TAMPING ROLLERS • VIBRATORS
CONCRETE BUCKETS • FLOODWELL BUCKETS • TRUCK MIXERS • STRIPPING MACHINES • TURNTABLES • ROAD FINISHERS • FORMS

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STEAM • GASOLINE • DIESEL

LOCOMOTIVES MECHANICAL or ELECTRIC DRIVE

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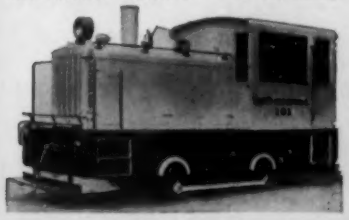

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**For LOW COST LARGE PRODUCTION**

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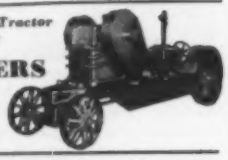
*Bronze or Roller Bearing*
**JAW CRUSHERS**
Heavy Armor plate steel or cast steel Constructed
Large capacity
Small power Requirements

*Self Traveling Tractor*
**JAW CRUSHERS**
Ideal for maintenance road work



**LIMESTONE PULVERIZERS**

Stationary or Portable

Crushes Large Stone to 2" minus Down to Agricultural Dust

Adjustable (8 Sizes)

Cross Section View of Pulverizer

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CRUSHERS · PULVERIZERS · GRINDERS

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HARDSOCG'S
DRILL FASTER *with* LESS AIR

New Type valve — lighter than other valves — operates the V-55 rock drill.

Drill has very strong rotation. Offset handle gives nice balance in operation.

*Write for Complete Specifications and Details.*

**HARDSOCG Drill Company**
Box 376 Ottumwa, Iowa

# Traffic and Transportation

***PROPOSED RATE CHANGES**—The following are the latest proposed changes in freight rates up to and including the week of July 19:*

## Central

67250. **Sand** (except industrial) and gravel in open top cars, C. L. (See Note 3.) Establish on, from Elkhart, Ind., to Goshen, Ind., 35c.

67275. **Mineral wool** (rock or slag), plain or saturated; bats, with or without paper backing or wrapping, and other than batts, C. L., min. wt. 40,000 lb. Establish on, from Wabash, Ind., to Chicago, Ill., 17c to alternate with present Class 35 rate.

67328. **Stone, crushed,** in bulk in open top equipment, C. L. Establish on, from Huntington, Ind., to Ferguson, Ind., 70c per net ton, via usual available routes.

67329. **Limestone, agricultural** (not ground or pulverized), in open top cars in bulk only, C. L. Establish on, from Carey, O., to Beloit, Garfield and Kensington, O., 138c per net ton, via C. & O. Ry., Upper Sandusky, O., P. R. R.

## Trunk Line

Sup. 1 to 39846. **Roofing granules,** made from shale, including such granules to which coloring pigments have been added during the process of crushing, screening and burning, C. L., min. wt. 50,000 lb., from Watsontown, Penn., to Niagara Falls, N. Y., $2.75 per net ton.

39907 (shippers). **Sand and gravel,** in open top equipment, C. L., min. wt. (see Note 2), from Succasunna, Lake Junction and Netcong, N. J., to Elmira and Horseheads, N. Y., $1.76 per net ton in lieu of current commodity rate of $1.98 per net ton. Reason: Comparable with rates from and to other points.

39931. **Lime, fluxing,** having no commercial value for building or chemical purposes, C. L., min. wt. 60,000 lb., from Thomasville, Pa., Group Stations, viz., Bittinger, Thomasville and York, Pa., to Vandergrift, Penn., $2.10 per net ton.

39998. **Stone, crushed and screenings,** C. L., (see Note 3) from Latrobe, Penn., to P. R. R. stations, viz., Pittsburgh stations, Rochester, Johnstown, Apollo, Dunbar, McKeesport, Rexis, Penn., and various others, ranging from 66c to $1.10 per net ton (see Note 5).

40002. **Roofing granules,** made from burnt shale or crushed or ground brick, C. L., min. wt. 50,000 lb., from Watsontown, Penn., to Fulton, N. Y., $3.10 per net ton, in lieu of current class rates. (See Note 5.)

40026. **Ground or pulverized limestone,** C. L., min. wt. 60,000 lb. from Muncy, Penn., to Akron, O., $2.35 per net ton, in lieu of current class rate of 28c per 100 lb. (See Note 5.)

40037. **Lime,** C. L., from Grove, Frederick and Buckeyestown, Md., $2.42 C. L. min. wt. 30,000 lb., $1.96 C. L. min. wt. 50,000 lb.; Security, Md., $2.31 C. L. min. wt. 30,000 lbs., $1.88 C. L. min. wt. 50,000 lb.; and Engle, Martinsburg, and Millville, W. Va., $1.80 C. L. min. wt. 30,000 lb., $1.48 C. L. min. wt. 50,000 lb., rates per net ton, to Gore, Va. Reason: Place rates on same basis as rates from these origins to other destinations.

## Southwestern

25089. **Limestone, ground,** Lampasas, Tex., to Denver, Colorado Springs and Pueblo, Colo. C. L. establish rates on ground limestone. C. L., min. wt. (see Note 1) to Denver, $4.88; Colorado Springs, $4.62, and Pueblo, Colo., $4.59. Rates are in cents per ton of 2,000 lb.

25155. **Stone, crushed, ground or pulverized,** Knob Lick, Mo., to Colorado. To establish rate of 440 cents per ton of 2000 lb. on stone, crushed, ground or pulverized, C. L., description and min. wt. as per item 8160B, W. T. L. Tariff 111-J, from Knob Lick, Mo., to Colorado Groups A, B, and C.

25159. **Fluorspar,** Presidio, Alpine and Marfa, Tex., to Carney's Point, N. J., Claymont, Del., Easton, Penn., and Philadelphia, Penn. To establish rate of $12.54 per ton of 2000 lb. on fluorspar, min. wt. 80,000 lb.

25186. **Stone, ground or pulverized,** Limedale Spur, Ark., to Shreveport, La. Establish rate of $2.00 per net ton on ground or pulverized stone in box cars, min. wt. 100,000 lb.

25241. **Phosphate rock,** Gulfport, Miss., and Mobile, Ala., to Barksdale Field and Shreveport, La. To cancel rate of 17c on phosphate rock, crude, not acidulated. C. L., min. wt. 80,000 lb.

## Illinois

IRC-7497-29. **Limestone,** crushed or ground, C. L., (see Note 1) from Valmeyer, Ill., to Burlington, Wis. Present, $2.99 per net ton; proposed, $2.44 per net ton.

9315. **Sand,** moulding, C. L., from Wyanet, Ill. To establish following rates to (representative) points: Beloit, Wis., $1.54; Janesville, Wis., $1.65; Milwaukee, Wis., $1.87; Madison, Wis., $1.87; Racine, Wis., $1.87; Gary, Ind., $1.76, being rates per net ton, plus Ex Parte 123 increase of 10 percent.

---

**Note 1—Minimum weight marked capacity of car.**

**Note 2—Minimum weight 90% of marked capacity of car.**

**Note 3—Minimum weight 90% of marked capacity of car, except that when car is loaded to visible capacity the actual weight will apply.**

**Note 4—Reason: No present or prospective movement.**

**Note 5—Reason: Comparable with rates from other origins in immediate vicinity.**

**Note 6—Rates will not apply on shipments in cars with tarpaulin or other protective covering. In such instances the rates applicable on shipments in box cars are to be assessed.**

**Note 7—The oil, tar or asphaltum not to exceed 10% of weight of the commodity shipped, the shipper to so certify on shipping order or bill of lading.**

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## PRICES BID
## Contracts Let

GREEN BAY, WIS.: Daanen and Janssen, DePere, Wis., bid 89c a cu. yd. for 9600 cu. yd. of gravel to be used in resurfacing of highway U. S. 141 between Bellevue and Denmark. The company was the only bidder.

•

WORCESTER, MASS., Commissioner of Public Works, Herbert Green announced that he awarded contracts for furnishing the department with screened gravel, concrete sand and run of bank gravel to the Worcester Sand & Gravel Co. The bid was 56c a cu. yd. for run of bank gravel, 80c for screened gravel and 65c for concrete sand.

•

MEDINA, OHIO. Medina Supply Co., was the low bidder for pea gravel at 98c applied.

•

SHELBY, MONT. Contracts for 7000 cu. yd. of gravel and sand has been let to the Shelby Sand & Gravel Co. for the Farmers Union Grain terminal that is to be under construction here soon. It is understood the contracts amount to more than $10,000 for this work.

•

BELLEFONTAINE, OHIO. McKinley & Brugler, Rushsylvania, were awarded the contract for supplying the City Street Department with approximately 1500 tons, of two types of crushed stone. The bid was for 90c per ton and $1.15 per ton for the No. 6 stone at the quarry or delivered in Bellefontaine. For the No. 46 stone the at-the-quarry bid was 80c and the delivered bid $1.05 per ton. Two other stone bids, computed at the price of one ton of each kind of stone delivered in the city showed the McKinley & Brugler bid was lower by 5c per ton than one and by 15c per ton on the other.

•

APPLETON, WIS. The county highway committee awarded William Wonkler, Greenville, contracts for crushing and delivery of about 500 cu. yd. of gravel on County Trunk KK at $1.10 per sq. yd.

•

RICHMOND, VA.: The Virginia Highway Department has placed contracts for 75,000 bbl. of cement totaling $175,000. Bids per bbl. were as follows: Coplay Cement Manufacturing Co., for delivery to Clifton Forge, $2.35; Universal Atlas Cement Co., for delivery to Millboro, $2.30, to Longdale, $2.36.


**PULVERIZERS** for the reduction of Cement Materials, Limestone, **Agricultural Limestone,** Fire Clay and All Dry, Refractory Materials.

Capacities: 1 to 60 tons per hour — Finenesses: 20 to 350 mesh

**BRADLEY PULVERIZER CO.**

*ALLENTOWN, PENNA.*

To Increase Capacities or Fineness of Present Grinding Plant—
To Reduce Power and Maintenance Costs—
To Insure an Absolutely Uniform Product—

***Use the* BRADLEY AIR SEPARATOR**

**THE ROSS FEEDER**

Completely controls the flow of any size material from Storage Bins, Hoppers or Open-Dump Chutes to Crushers, Conveyors, Screens, etc.

High in efficiency. Low in maintenance and power consumption.

Furnished in sizes to suit your operation. Send full particulars for recommendation.

ROSS SCREEN & FEEDER CO.

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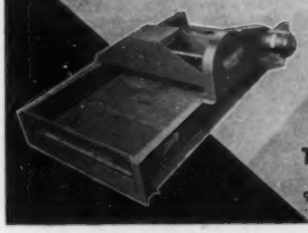
THE Leahy HEAVY DUTY

No-Blind VIBRATING SCREEN with TRI-VIBE —for Fine Mesh Screening



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**No Power Waste**
Operates at full capacity and efficiency with 1 H. P. motor
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*The Original Deister Co., Est. 1906*
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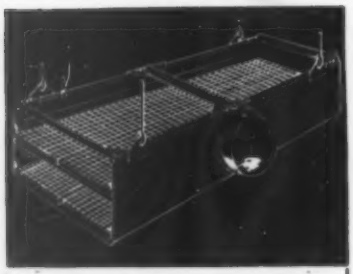
for CRUSHERS, PULVERIZERS, ROLLS, SCREENS

for SHOVELS, DREDGES, CRANES, CONVEYORS

**The Frog, Switch & Mfg. Co.**

*Established 1881* — CARLISLE, PA.



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5 DISTINCTIVE FEATURES . . .
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2. Eight Positive Stroke Adjustments.
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MAKE YOUR SCREENING SURFACES MORE EFFECTIVE
By having the perforations properly spaced to give greatest capacity and durability. H & K screens are designed to provide largest amount of open area without loss of strength. Any size, any shape, and metal, any perforation.
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## OBITUARIES

CHARLES M. DOOLITTLE, president and general manager of Canada Crushed Stone, Limited, Hamilton, Ont., Canada, died suddenly at the age of 65 on July 5. He had been a regional vice-president or a director of the National Crushed Stone Association for many years. His many friends in the United States had been looking forward to his attendance at the coming 25th annual convention as one of the real "old timers." He was born in Plainsville, Ohio, but had lived in Hamilton since he was three years old. His father was associated with Ontario Rolling Mill Co., and with C. S. Wilcox, uncle of the deceased, was one

Charles M. Doolittle

of the founders of the Steel Company of Canada. Mr. Doolittle graduated in mining engineering from Queens University in 1904. Purchase of a small quarry at Rymal gave him his start in the business which he developed into one of the largest of its kind in Canada.

He is survived by his widow, formerly Marie E. Wylie, two sons, Charles H. and James Ridley Doolittle, and three daughters, Mrs. Ralph E. Entwistle, Marie Elizabeth Doolittle, and Mrs. Douglas S. Watson.

•

J. S. WALKER, for many years district sales representative of the Giant Portland Cement Co., in Richmond, Va., died recently.

•

CHARLES H. TURNER, president of the Spruce Pine Mica Co., Spruce Pine, N. C., passed away recently at the age of 65. Mr. Turner had been president of the company for about 15 years.

JOHN W. FRY, Columbia, Tenn., for many years active in developing the Tennessee phosphate rock industry died recently. He was president of the Farmers and Merchants Bank, Columbia, and helped organize the International Agricultural Corp. and the Consolidated Phosphate Co.

•

ANTHONY J. BRUCK, concrete products manufacturer, Kokomo, Ind., died recently, aged 76 years.

•

Robert M. Peterson, assistant advertising manager, American Steel & Wire Co., Cleveland, Ohio, died recently.

•

ARTHUR G. BECK, manager of the Montreal plant of Canada Cement Co., Ltd., died recently at the age of 61 after a very short illness. Mr. Beck was a native of Columbia, N. J., and was well known in cement circles in both the United States and Canada.

## Manufacturers' News Notes

**Allis-Chalmers Manufacturing Co.**, Milwaukee, Wis., has announced through President Max W. Babb that a new department has been set up known as Priorities Management. This department will have direction of presenting, for the company, matters concerning priorities to the Office of Production Management and all other government departments or regulating bodies, including Congressional, governmental and industry committees, the application of priorities to the company's suppliers of materials, industry priorities as distinguished from a priority issued for specific contracts, and to help to compile information to permit the shop to arrive at a proper decision in the problem of shop schedules between two or more jobs bearing the same priorities. L. W. Grothaus, vice-president, heads this department. G. V. Woody is administrator, and O. S. Larkby is his assistant.

**The B. F. Goodrich Co.**, Akron, Ohio, has named Clyde DeLong as operating manager of the mechanical sales division, according to an announcement by W. S. Richardson, general sales manager.

**Hercules Powder Co.**, Wilmington, Dela., has appointed Dr. Theodore M. Switz as director of the Export Department, succeeding P. W. Meyeringh who was recently elected a vice-president and member of the executive committee.

**Greene, Tweed & Co.**, manufacturer of packings, has moved its manufacturing plants and general offices to the Palmetto building, at Bronx Boulevard and 238th Street, New York, N. Y.

**Hercules Powder Co.**, Wilmington, Dela., has announced the purchase of the synthetic resin business of John D. Lewis, Inc., Providence, R. I., a producer of synthetic resins. The Lewis company will continue the production of textile and heavy chemicals at Mansfield, Mass.

**Worthington Pump and Machinery Corp.**, Harrison, N. J., has appointed R. M. Cleveland, a veteran of 24 years service with the organization, as manager of its Boston Office, succeeding W. A. Finn who has been called to active duty with the Navy. Mr. Finn has been with Worthington since resigning his commission as a Naval officer in 1926. A. W. Parker, in charge of publicity and for a number of years product designer for the company, has retired.

**PERFORATED METAL**
**SAND AND GRAVEL SCREENS**

*Manufactured exactly to your specifications*

**Any size or style screen, in thickness of steel wanted with any size perforation desired.**

**We can promptly duplicate your present screens at lowest prices**

**CHICAGO PERFORATING CO.**
2437 West 24th Place
CHICAGO, ILLINOIS
Canal 1459

**RYERSON CERTIFIED STEELS**

**10 Strategically-Located Plants**

Principal products include—Alloy Steels, Tool Steels, Stainless Steel, Hot Rolled Bars, Hoops and Bands, Beams and Heavy Structurals, Channels, Angles, Tees and Zees, Plates, Sheets, Cold Finished Shafting and Screw Stock, Strip Steel, Flat Wire, Boiler Tubes, Mechanical Tubing, Rivets, Bolts, etc. Write for Stock List. Joseph T. Ryerson & Son, Inc. Plants at Chicago, Milwaukee, St. Louis, Cincinnati, Detroit, Cleveland, Buffalo, Boston, Philadelphia, Jersey City.

**McLANAHAN EQUIPMENT**
**for ROCK— SAND—GRAVEL**

Single and double roll and jaw crushers, hammer mills, super dry pans, steel log washers and scrubbers, sand drags, revolving and vibrating screens, elevators, conveyors, dryers, jigs, hoists. Complete portable, semi-portable and stationary crushing, screening and washing plants for different capacities of any materials.

**McLanahan & Stone Corporation**
Established 1835
Hollidaysburg, Pennsylvania

**SAVE STEEL FOR NATIONAL DEFENSE**

**WELD** Jaw Plates, Gyratory and Roll Crushers, Shovel Teeth, Hammers, Tractor Tread Grousers

with

**MANGANAL**

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*11 to 13½% Manganese Nickel Steel*

WELDING ELECTRODES, WEDGE and APPLICATOR BARS, HOT ROLLED PLATES

**STULZ - SICKLES CO.** *Sole Producers* 134-142 Lafayette St., Newark, N. J.

*Sold Thru Distributors Only*

**"Nat-Aloy" Uniform Temper Lock Crimp Meshes Assure Accuracy for the Life of Screen**

Tough screens that resist abrasion, will not crystallize. Longer life—less replacements. Furnished also in flat top and double crimp meshes. Long slot screens.

Immediate shipments from stock . . . all width, all meshes . . . Attractive prices.

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**NATIONAL WIRE CLOTH CO., Inc.**
252-270 W. FAIRFIELD AVE. — ST. PAUL, MINN.

**HAYWARD BUCKETS**

**USE RIGHT BUCKET FOR THE JOB**

Hayward makes all four—clam shell, drag-line, electric motor, orange peel. A Hayward recommendation is unprejudiced.

**THE HAYWARD COMPANY**
202-204 Fulton Street
New York, N. Y.

**Condor RUBBER PRODUCTS**

**BELTING**
Conveyor, Elevator, Compensated, Transmission, Agricultural and V-Belts. Belting for every Service.

**HOSE**
Air, Acid, Contractors, Fire, Hydraulic, Oil and Gasoline, Steam, Sand Blast, Suction, Water, Spray and Special Hose. 81 Kinds for 81 Uses.

**OTHER PRODUCTS**
Chute Lining, Molded Rubber Goods, Industrial Brake Blocks and Lining, Rubber Lined Tanks, Rubber Covered Rolls—Abrasive Wheels, Bowling Balls.

***Keep Ahead with* MANHATTAN**

**THE MANHATTAN RUBBER MFG. DIVISION**
OF RAYBESTOS-MANHATTAN, INC.
**111 Townsend St., Passaic, N. J.**

**Jeffrey**

**A NAME THAT STANDS FOR QUALITY—LONG SERVICE**

Chains
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Bucket Elevators
Feeders
Screens
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Portable Loaders and Conveyors
Car Pullers
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Baltimore, Birmingham, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Denver, Detroit, Huntington, Houston, Milwaukee, Pittsburgh, Philadelphia, New York, Scranton, Salt Lake City, St. Louis, Terre Haute

High-Capacity Screens
● Designed especially for damp, sticky, and fibrous materials—Speeds up production!
The W. S. TYLER Company
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CLEVELAND, OHIO • U. S. A.

FARREL BACON CRUSHERS

Complete plants designed and equipped, including Screens, Elevators and Conveyors. Machinery for Mines and Rock Quarries, Sand and Gravel Plants.

Engineering Service

EARLE C. BACON, Inc.

17 John St., New York, N. Y.


**Dodge Brothers Corporation** has appointed Allison Miller, assistant sales manager, Truck Division. Prior to his present appointment, Mr. Miller was Philadelphia regional manager for Dodge.

**Gar Wood Industries, Inc.**, Detroit, Mich., has appointed Standard Truck Equipment Co., Jackson, Miss., as an authorized distributor.

**Haynes Stellite Co.**, Kokomo, Ind., a unit of Union Carbide and Carbon Corporation, announces the retirement of James H. Maguire from his active duties as works manager of the company. He will continue with the company, however, in a consulting capacity. Other personnel changes in the works organization of the company are: F. T. McCurdy, general superintendent in charge of production and operating departments; J. R. Brown, formerly production manager, will be assistant superintendent, and H. C. Fretz, as assistant to the superintendent, will be in charge of foundries. Mr. Fretz was formerly general foundry foreman.

**Marmon-Herrington Co., Inc.**, Indianapolis, Ind., reports that with the completion of additions made during the past year the plant capacity has been increased five times that of a year ago. All-wheel-drive trucks, track-laying tractors and tanks are being made in the plant for industrial use and for military purposes of this country and foreign lands.

**Pittsburgh Plate Glass Co.**, Pittsburgh, Penn., announces the appointment of Dr. G. L. Cunningham as manager of the Technical Service Department. Dr. Cunningham joined the company in September last year after having served as research chemist at Mathieson Alkali Works since 1930.

**Johns-Manville Corporation**, New York, N. Y., announces the appointment of Dr. C. F. Rassweiler as Director of Research. Lewis H. Brown, president of the corporation, in making the announcement, pointed out that more than half of Johns-Manville sales today come from products which have been added by the company's research, development and expansion program of the last twelve years, and the appointment of the new research director is made in preparation for increased activity in product improvement and new development.

**The Lincoln Electric Co.**, manufacturers of arc welding equipment, Cleveland, Ohio, has elected M. R. Dill as a director of the company. Mr. Dill was also elected general counsel. Directors and officers who were re-elected include: J. C. Lincoln, chairman of the Board of Directors; J. F. Lincoln, president and general manager; C. M. Taylor, vice-president; A. F. Davis, vice-president and secretary; G. G. Landis, chief engineer; Harold F. Kneen, plant superintendent; J. W. Merlam and W. B. Stewart.

**Worthington Pump & Machinery Corp.**, Harrison, N. J., has just distributed more than 2800 lapel emblems to employes who have completed five years or more of service in appreciation of loyal and cooperative service.

**The B. F. Goodrich Co.**, Akron, Ohio, has elected George T. Kilmon as assistant secretary and Edward M. Martin, assistant treasurer of the company. Mr. Kilmon, member of the B. F. Goodrich legal staff for the last 16 years, will be in charge of the company's law department filling the vacancy caused by the recent death of J. L. McKnight.

**The Manhattan Rubber Mfg. Division**, Rabestos-Manhattan, Inc., Passaic, N. J., won the annual award of the National Advertising Agency Network for "The Best Advertising Campaign in Business Papers." The Manhattan campaign was entered by The Roland G. E. Ullman Organization, Philadelphia, Penn. The advertising is under the direction of James J. DeMario, advertising manager.

**Joseph T. Ryerson & Son, Inc.**, Chicago, Ill., announces that a new connecting bridge between its main office buildings is now being erected to facilitate the company's expanding activities.

**B. F. Goodrich Co.**, Akron, Ohio, has made the following changes in sales personnel; O. C. Mueller goes from Cincinnati to Pittsburgh and is succeeded at Cincinnati by A. C. Lutz; J. M. Cooney goes from Cincinnati to Dayton.

## New Incorporations

**Cramer Concrete Co., Inc.**, Dallas, Texas, has been incorporated with a capital stock of $3000. Incorporators are Roy Cramer, Bertie Cramer, and J. W. Crowley.

**Gulf Sand Co.**, Beaumont, Texas, has been organized with capital stock listed as $10,000, and having the following incorporators: C. W. Lane, J. W. Bourbon, and Edward F. Lotz.

**Shelton Concrete Products Co.**, Shelton, Wash., is the name of a new company. Montgomery & Montgomery, 512 Hoge building, Seattle, Wash., are agents.

**Wilbert Vault Works** of Owensville, Inc., Owensville, Ind., has been organized to engage in the concrete burial vault business with 100 shares, no par value. Harry Bennett, 313 Mill street, Owensville, Ind., is agent, and B. B. Bickes, Asher D. Kahn, and Irma Bickes are incorporators.

**Dixwell Quarries, Inc.**, Hamden, Conn., has been incorporated with a capital of $100,000. Incorporators are: Louis G. DeFelice, Angeline De Felice, and Harold L. De Felice, all of New Haven, Conn.

**Cinder Concrete Block, Inc.**, Newark, N. J., is a new company with 2500 shares of capital listed. Harry Phillipson is agent.

**The Falk Corporation**, Milwaukee, Wis., has appointed W. L. Schneider as a vice-president, T. F. Scannell as sales manager and J. B. Kelley as assistant sales manager.

**The Timken Roller Bearing Co.**, Canton, Ohio, has announced the appointment of C. M. Maratta, maintenance engineer, as chief works engineer, succeeding the late W. C. Makley. Walter F. Green becomes his assistant.

**Worthington Pump and Machinery Corp.**, Harrison, N. J., has appointed Carleton Reynell as general manager of purchases and traffic; Frederic W. Thomas as assistant general manager of purchases, and Dean K. Chadbourne as assistant general manager of traffic.

**Link-Belt Co.**, Chicago, Ill., advises that F. V. MacArthur has resigned as secretary and assistant treasurer after nearly 50 years of service, and is succeeded by Harry E. Kellogg.

**Carnegie-Illinois Steel Corp.**, Chicago, Ill., reports the appointment of Herbert J. Watt as manager of sales for the western area, with headquarters in Chicago.

**Marinette Granite Co.**, Milwauke, Wis., has been organized with 906 shares, no par value. Deal in quarries and quarry lands. Ralph Skidmore, Carl Westring and Elmer Grimmer.

**The Tigertail Quarries, Inc.**, Miami, Fla., has been incorporated; 100 shares, no par value; T. W. Palmer, A. C. Hall, L. Kaplan, directors.

**Fisher Fluorspar Corp.**, 135 South La Salle St., Chicago, Ill., 5,000 shares common, par value at $5 a share. Incorporators are C. E. Fisher, J. C. Culbertson, and Wm. R. Stuart. Correspondent is W. R. Stuart, 135 S. La Salle St.

**Carolina Asbestos Co.**, Marshville, N. C., is the name of a new company, with a capital of $100,000.

**France Granite Co., Inc.**, Macon, Ga., is the name of a new company incorporated by Logan Lewis, Buford Mathis and Miss Sara Moore to engage in general mining and quarrying.

# Classified Advertisements

**POSITIONS WANTED — POSITIONS VACANT** Set in six-point type. Minimum $1.00 each insertion, payable in advance.

**INFORMATION**—Box numbers in care of our office. An advertising inch is measured vertically in one column. Three columns, 30 inches to the page.

**CLASSIFIED**—Displayed or undisplayed. Rate per column inch, $5.00. Unless on contract basis, advertisements must be paid for in advance of insertion.

## READY—No Waiting for Delivery with CONSOLIDATED Used Machinery

**OLIVER FILTERS**

3—Oliver Rotary Continuous Filters, 8'x10', wood stave, closed steel head, steel trough, oscillating agitator, reduction gear drive, no motor, complete with receivers, pumps.

**GYRATORY CRUSHERS**

1—36" Style "N" Allis-Chalmers, short shaft.
1—16" Telsmith No. 7.
1—30" Superior McCully.
1—20" Superior McCully.

**GYRATORY REDUCTION CRUSHERS**

1—1'8" Traylor TY.
1—410-TZ, capacity 150 t.p.h. through 1¼" square mesh; 10" feed opening.
1—Kennedy No. 25 with motor in pulley.
1—Kennedy No. 49 with motor in pulley.
1—Kennedy No. 19, V-belt drive.

**JAW CRUSHERS**

30x42" Buchanan Type "C"; 48x42" Traylor Bull-dog; 66x86 Traylor; 36x24 Farrel; 18x36 Farrel; 24x36 Allis-Chalmers; 8x36 Universal Roll Jaw; 18x30 Allis-Chalmers and smaller sizes.

**ROTARY DRYERS, DIRECT HEAT**

Ruggles-Coles, double shell: 5'x26', 5'x30', 5'6"x60', 80"x45'.
Single Shell: 4'x30', 5'x30', 6x40, 6x50, 6x60, 8x20, 8'6"x55.

**ROTARY KILNS**

6'60', 8'x110'.

**CRANES**

1—55B Bucyrus Erie Crane, Atlas Imperial Diesel Engine, Dragline Fairleads; 110 ft. boom; lifts 62,000 lbs. at 20 ft.
1—Lorain "95" Dragline, 2 yd., 100 ft. boom, "Caterpillar" Diesel.

**2—6'x12' ROD MILLS**

Hardinge straight side Rod Mills, iron lined, herringbone steel gears, enclosed gear drive units, charge of rods with each mill. Arranged for peripheral or trunnion discharge. In excellent condition and for immediate shipment.

1—Bucyrus Erie Steam Driven 50-B Crane, equipped with Pile Driver Fairleads; double drums, 75' boom. Lifts 68,000 lbs. at 15 ft.
1—Marion No. 381 Crane, equipped with Waukesha-Hesselman Oil Engine; 75' boom.
1—Class 17 Clyde Whirley. Lifts 30 tons at 20 ft.

**AIR COMPRESSOR**

1—Ingersoll-Rand No. 315-A, driven by Hesselman Oil Engine.

**HAMMER MILLS**

22"x15" Penna. 8X-2, 4x1" hammers, adj. grate.
36"x24" Gruendler No. 4XA, 60—2"x1" hammers.
24" Mikro Pulverizer No. 4-TH, stirrup hammers.
No. 5 Williams Roller Knife Shredder, 40"x30".
No. 4 and No. 6 Williams "Jumbo".
20" dia. x 24" Dixie, direct conn. 40 H.P. A.C. motor.
24"x20" Jeffrey Type B-2 Shredder.
30"x24" Stedman, Model "A".
No. 3 and No. 5 Jay Bee Mills.

**DIESEL GENERATING SETS**

1—500 H.P. F-M, Model 33, Style M, 257 RPM, 4-cyl., 16"x20", with magnetic clutch and pulley take-off. Used two years.

2—1200 H.P. McIntosh & Seymour, Type 8-B-40, 8-cyl., 20"x24", 250 RPM. For sale with or without direct connected 800 KW Westinghouse d.c. generator. We have just sold two of these sets.

**VIBRATING SCREENS**

3—4'x7' Leahy, 2 deck, motor driven.
8—3'x5' Tyler Hummer, 2 deck, No. 31, enclosed.
1—3'6" x 8' Link-Belt, Type NP-148, 1 deck.
2—4'x7' Jeffrey-Traylor, Type FB-4, 2 deck.
1—No. 52 Rotex, 5'x10', 2 deck.
2—3'x7' Simplicity, 2 deck, motor driven.
3—3'x8', 3'x10' Niagara, 3 deck.
1—4'x8' Huron, 1 deck, V-belt drive.

**LIME HYDRATOR**

Weber type, made by Arnold & Weigel with No. 1 Raymond Bros. Lime Separator; also Kritzer.
One complete Hydrated Lime Plant.

**CENTRIFUGAL AIR SEPARATORS**

10' Sturtevant; 8', 10' 12' Gayco; 6' Raymond; also 5' dia. Raymond "Whizzer" for attachment to roller mill. 5' Gayco.

**BALL, ROD AND TUBE MILLS**

Ball Mills: 3'x5', 5x10, 6x6, 6x8.
Rod Mills: 4'x8', 6x12 Hardinge, straight side.
Tube Mills: 2—5'x20' Bonnot Co., silex lined.
1—5'x22' Bonnot Co., silex lined.
6'x23', 2—6'6x20' Smidth, silex lined.
5'x22' Allis-Chalmers, 5'x35' Vulcan, both iron lined.

**RAYMOND PULVERIZERS**

2—4 roll High Side, located Toledo.
Nos. 0000, 00, 1 and 3, Beater type—also Nos. 55, 00, 00 Imp type, also No. 40 Imp with 6' Centrifugal Separator.

**CONSOLIDATED PRODUCTS CO., INC.**
**15-16-17 PARK ROW** *Our Shops at Newark, N. J., cover eight acres.* **NEW YORK, N. Y.**

## SCREENING, CRUSHING, POWER EQUIPMENT

5—5½'x22' Smidth "Cycleb" Tube Mills for grinding cement aggregate
1—28s Koehring Concrete Mixer
1—9x15" Blake-Davis Jaw Crusher
1—18x36" Blake-Farrel Jaw Crusher
1—165 KW G.E. Motor Generator Set, direct connected
1—300 HP 720 RPM G.E. Synchronous Motor
1—430 HP 720 RPM G.E. Synchronous Motor
4—4'x5' Type 33 Enclosed Hummers with or without generators
1—40"x60" Mitchell Electric Screen
2—5½'x6' Newaygo Belt Drive Screens 1, 2, or 3 Screening Surfaces

***All Machines Fully Reconditioned***

**MORSE BROS. MACHINERY CO.**
P.O. Box 1708 Denver, Colorado

## EQUIPMENT FOR SALE

1—Link Belt Combination Washing Screen, 48"x 18' Trunion type, timber frame.
1—7 ton Plymouth Locomotive, 56½" gauge.
1—Ingersoll Rand size 90 nonreversible close quarter Air Drill.
2—Thor No. 263Y Air Drills nonreversible rotary model 2371.
13—Sullivan type L-9 jackhammers, A-T rotator, chucks for 1"x4¼" hex steel.
9—Sullivan type L-12 Jackhammers, A-T rotator, chucks for 1"x4¼" hex steel.
5—Sullivan type T-6 Leyner Drifter Drills, wet type.
2—Sullivan type T-10 Leyner Drifter Drills, 24" feed screw, 51.42 rotation and chucks for 1¼" round lugged steel.
1—Sullivan type S-9 Stoper, wet type, 1" hex chuck bushing.
2—Sullivan type U-143 Tripods complete with weights.
1—Sullivan Class K-9 Concrete Buster with 1"x 4¼" hex steel chuck parts.
2—Ingersoll Rand size 200 Air Driven Chipping Hammers with hex chuck.
2—Ingersoll Rand size DEA Angle Wrenches.

**PENN-GREG MANUFACTURING CO.**
**1115 Hennepin Ave., Minneapolis, Minn.**

## LOCOMOTIVES SHOVELS — CRANES CARS

1—50 ton American Saddle Tank A.S.M.E. Boiler
1—40 ton Porter Saddle Tank, new firebox in 1940
1—32 ton Porter Saddle Tank, rebuilt

15—Modern Covered Hopper Cement Cars

1—17½ ton Brownhoist Steam Loco. Crane, New A.S.M.E. Boiler
1—15 Ton Industrial Steam Loco. Crane, New Tubes. Nat'l Board Boiler

1—1½ Yd. Rehandling Clamshell Bucket, Like New

**Birmingham Rail & Locomotive Co.**
**BIRMINGHAM, ALA.**

## FOR SALE

Slackline outfit complete, in excellent condition. Consisting of 100 H. P. slip ring motor—two speed hoist—80 foot all steel mast — One 2 yd. bucket — one 1½ yd. bucket. Bargain.

**R. W. ROBINSON**
**P. O. Box 603, Austin, Texas**

## New—RAILS—Relaying

**ALL SECTIONS**

Also contractors' equipment, "V" shaped and Western cars, 24 and 36-in. gauge, portable track, gas locos, frogs and switches. Attractive prices quoted. Wire, write or telephone for quotations.

**M. K. FRANK**

480 Lexington Ave. New York, N. Y. — 25 St. Nicholas Building Pittsburgh, Pennsylvania

## READY MIXED CONCRETE PLANT EQUIPMENT

1—Butler 150 ton, 3 compartment bin with extra Cement Compartment and Weighing Batchers.
1—Blaw-Knox One Yard, three material aggregate Weighing Batcher with Beam Scales.
1—Johnson One Yard Cement Weighing Batcher; Good condition.
1—Fuller Kinyon Cement Conveying System; capacity 140 bbl. per hour, with type C-40 Rotary compressor; gasoline engine drive; new in 1937 and used on one small job. Excellent Offering.

**H. B. FULLER EQUIPMENT CO.**
**1836 Euclid Ave., Cleveland, O.**

## FOR SALE

8" Morris Manganese Steel Sand Pump. New Castings and Impeller. With base for direct connection $450.00; without base, $400.00. Serial No. 98409-8 A. Also 5" and 4" High Pressure Water Pumps.

**BROADWAY CONSTRUCTION CO.**
**14005 Broadway, Rt. No. 10, Cleveland, O.**

## DRYER

1—70" x 35'-0" Ruggles-Coles, A-10 Rotary Dryer with Central Tube.

**McDERMOTT BROS. CO.**
**Allentown, Pa.**

**HYDRATORS**
3 Kritzer & Schultless Hydrators.

**AIR COMPRESSORS**
**BELTED:** 355, 528, 676, 1000, 1300 & 1570 Ft.
**ELECTRIC:** 478, 676, 807, 1302, 1722 & 2200 Ft.
**DIESEL:** 603, 807 & 1000 Ft.
**PORTABLE GAS:** 110, 160, 220, 310, 540 & 1300 Ft.
**STEAM:** 49, 310, 526, 1200, 2200 & 3600 Ft.

**CLAMSHELL BUCKETS, SKIPS & GRAPPLES**
Owen R A & H Stone Grapples.
2 Yd. OWEN Type B Material Handling.
1½ Yd., 1 Yd. & ¾ Yd. HAYWARD Class E.
18 Steel Skips 6½ x 8 x 2½.
5 Ton Bucyrus Rock Grabs.

**CRANES AND DRAGLINES**
¾ Yd. 5 Ton O & S 30 Ft. Boom.
12 Ton NORTHWEST 50 Ft. Boom Gas.
20 Ton LIMA, 750 Diesel, 65 Ft. Boom.
25 Ton BROWNING & 30 Ton AMERICAN Loco.
25 Ton LINK BELT K-48 Electric, 70 Ft. Boom.

**CATERPILLAR SHOVELS**
¾ Yd. Lima Diesel.
2 Yd. Marion Steam Shovel.
¾ Yd., 1½ Yd., 2 Yd. & 4 Yd. MARION Electrics.
1 Yd. NORTHWEST Gas.
1½ Yd. LIMA Diesel.
1½ Yd. BUCYRUS 41B Steamer.
4 Yd. Bucyrus 120B Electric. Also 3 yd. Erie Elec.

**DUMP CARS**
46—KOPPEL 1½ Yd. 24 & 30 In. Ga., V Shaped.
15—2 Yd., 3 Yd., 4 Yd., 6 Yd., 12 Yd., 36 In. Ga.
20—Std. Ga. 12 Yd., 16 Yd., 20 Yd. & 30 Yd. Cap.
15—Std. Ga. 50 Ton Battleship Gondolas.

**FLAT CARS**
9—50 ton std. ga. heavy duty flat cars.

**HOISTING ENGINES**
Gas: 15, 30, 60, 100 & 120 HP.
Electric: 20, 52, 80, 100 & 150 HP.
Steam: 6¾x8, 7x10, 8¼x10, 10x12, 12x14.

**DIESEL UNITS**
75, 90, 180, 200 HP F. M. Engines.
110 HP Ingersoll Rand Engine.
175 KVA Worthington 3/60/2300.
275 KVA Fairbanks 3/60/2300.

**BALL, ROD AND TUBE MILLS**
6x8 Pebble Mill & 5x5 Batch Mill.
5'x22" HARDINGE CON. Dry Ball Mill.
6'x22" HARDINGE CONICAL Pebble Mill.
8'x22" HARDINGE CONICAL Ball or Pebble Mill.
4x8, 8x6 & 10x9 Straight Ball Mills.
4x16, 5x18 & 5x22 Tube Mills & 6'x22'.
2½ x 8 & 5x7 Air Swept Tube Mills.
2x4½, 6x12 & 5x12 ROD MILLS.

**PULVERIZERS**
JEFFERY 24x20 & No. 1 Sturtevant Ring Roll.
RAYMOND Auto Pulverizer No. 0000, 0 & 3.
RAYMOND Imp. Mills, No. 4, 32 & 55.
GRUENDLER XXB Mill & Jay Bee No. 3 & 4.
RAYMOND 4 & 5 ROLL MILLS & 5 ft. Chaser M.

**STEEL STORAGE TANKS**
10,000 Gal., 15,000 Gal. & 20,000 Gal. Cap.

**MATERIAL BIN**
116 Ton Blaw Knox 2 Compt.

**400 BARREL CEMENT BIN**
400 Barrel Butler Portable Steel Cement Bin with Fuller automatic batcher, push button control.

**SEPARATORS AND COLLECTORS**
8, 10 and 14 ft. Separators, Gayco & Bradley.

**ROLL CRUSHERS**
36x60 Fairmount & 36x20 Diamond.

**JAW CRUSHERS**
10x8, 13x7½, 14x7, 15x9, 15x10, 16x9, 16x12, 16x10, 18x11, 20x8, 20x6, 20x10, 20x13, 26x12, 30x15, 30x13, 36x15, 36x30, 36x18, 36x14, 36x9, 36x6, 36x10, 36x24, 42x9, 48x42, 48x36, 60x42, 84x66, 36x16, 9x36.

**CONE & GYRATORY CRUSHERS**
42 in. McCully Mammoth Gyratory.
5 No. 19, 25, 37 & 49 Kennedy.
18 in., 24 in., 30 in., 36 in. and 48 in. Symons Disc.
4—10 TZ Traylor 4 ft. Gyratory.
4—Nos. 5, 3 & 6 Austin Gyratory.
2—Traylor T-12 Bulldog Gyratory, also 16 inch.
8 in. Traylor T. Gyratory.
17 Gates K—Nos. 3, 4, 5, 6, 7½, 8 & 9½.
10 Inch Austin Model 105.
6, 10 & 13 inch Superior McCullys.

**SYNCHRONOUS MOTOR GENERATORS**
100 K.W. RIDGWAY 3/60/2200-250-275 volt.
150 K.W. GEN. ELEC. 3/60/2200-250-275 v.
200 K.W.RIDGWAY 3/60/2200-250-275v.,900 rpm.

**SLIP RING MOTORS**
52 H. P. GEN. ELEC. 3/60/440 v., 1200 rpm.
(3) 100 H.P.GEN.ELEC. 3/60/440v.,900-1200 rpm.

**CONVEYOR PARTS**
**BELT:** 1000 Ft.60 In.,700 Ft.40 In., 600 Ft.36 In., 800 Ft.30 In., 1642 Ft.24 In., 517 Ft.20 In., 297 Ft.18 In., 500 Ft.16 In., 300 Ft.14 In.
**IDLERS:** 54 In.,42 In.,36 In.,30 In., 24 In.,20 In.,18 In.,16 In. & 14 In.
Head & Tail—Pulleys—Takeup for all sizes.
Steel Frames: 2,000 Ft.24 In. 30 In.& 36 In.Sections.

**ROTARY DRYERS AND KILNS**
36 In.x20 Ft.,3 Ft.x30 Ft., 4 Ft.x30 Ft., 54 In. x 30 Ft., 42 In.x24 Ft., 5 Ft.x30 Ft., 5 Ft.x16 Ft.,5 Ft.x60 Ft.,6 Ft.x60 Ft.,6 Ft. x 20 Ft., 6 Ft.x70 Ft.,10x20,7½x100 & 8x110 Ft. Kilns.

**STEEL DERRICKS**
**GUY:** 8 Ton 85 Ft. Boom, 15 Ton 100 Ft. Boom, 20 Ton 115 Ft. Boom, 50 Ton 100 Ft. Boom.
**STIFF LEG:** 5 Ton 70 Ft. Boom, 15 Ton 100 Ft. Boom,25 Ton 100 Ft.Boom,75 Ton 135 Ft.Boom.

**LOCOMOTIVES**
**GASOLINE:** 3 Ton,5 Ton,8 Ton,12,14,and 20 Ton.
**STEAM:** 9 Ton,20 Ton,40 Ton,60 Ton & 80 Ton.
**ELECTRIC:** 2 Ton, 3 Ton, 8 Ton, 40 Ton.
**DIESEL:** 4, 8 & 15 Ton.

**SCREENS**
**VIBRATING:** 2x4, 3x6, 12x8, 3x8, 3x5, 4x5, 4x8, 4x10, 48x72 & 4x12, 1, 2 & 3 Deck.
HUMMER, ROTEX, NIAGARA & ROBINS.
**REVOLVING:** 3x12, 3x16, 3½x18, 3x24, 4x16,4x20, 4x28, 4x24, 5x30, 5x20, 6x20.

**TIDEWATER EQUIPMENT & MACHINERY CORP.**
COMPLETE PLANTS BOUGHT AND SOLD
Lincoln Bldg., 60 East 42nd Street
New York, N. Y.

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**LOCOMOTIVE CRANES**
1—15 ton Brownhoist.
1—22½ ton Orton & Steinbrenner.
1—25 ton Industrial.
1—30 ton Ohio.
All of the above with double drums, thoroughly modern with National Board Boilers.

**GANTRY CRANES**
1—60' span 4 motor, bucket operating 440 volt AC.
4—4 motor type AC current bucket operating 5 and 10 tons capacity having spans 17'6"—46'—61'6" some with overhang, some without. Ideal for material handling and handling of concrete piles, etc. Excellent condition.

**WRECKING CRANE**
1—50 ton steam, standard gauge gooseneck boom.

**SPREADER CAR**
1—Jordan all steel spreader car standard gauge rebuilt.

**AIR DUMP CARS**
8—Koppel 20 yd. capacity excellent condition.

**CLAMSHELL BUCKET**
1—Blaw Knox 1 yd. capacity clamshell bucket Model 616.

**DRAGLINE BUCKET**
1—Sauerman 1 yd. capacity dragline bucket with carrier equipment.

**SINGLE ROLL CRUSHER**
1—24" x 24" all steel single roll crusher. Condition same as new.

**CRUSHING ROLLS**
2—Sets Buchanan all steel crushing rolls 48" diameter 30" face. Condition for immediate service and delivery.

**DIESEL OIL ENGINE**
1—450 H.P. 4 cylinder 4 cycle, solid injection, 225 RPM with or without 300 KW AC 2200 volt generator.

**JAW AND GYRATORY CRUSHERS**
All sizes and types.

**HOISTS**
1—Sullivan electric dragscraper or sluicing hoist, double drums 60 H.P. 440-2200 volt AC motor.
1—Sauerman steam slackline or cableway hoist cylinders 10 x 12.
1—Sauerman double drum dragscraper hoist, electric 75 H.P. AC 440 volt.
1—60" dia. x 36" face.
1—72" dia. x 30" face single drum mine type hoist 150 H.P.
1—78" dia. 72" face 300 H.P.
1—50" dia. single drum hoist 100 H.P. motor.
All of the above are 440-2200 volt AC motors.

**DRYERS**
1—6' x 60' single shell.
1—6' x 30'.
1—54" x 40'.

**DREDGE PUMP**
1—Morris 10" dredge pump, manganese fitted, belt drive.

**PORTABLE DIESEL DREDGE**
1—All steel portable diesel dredge mounted on all steel pontoons powered with 200 H.P. Cummings diesel motor, variable speed.

**MOTOR GENERATOR SET**
1—100 H.P. 440 volt AC to 65 KW 230 volt DC.

**LOCOMOTIVES, STANDARD GAUGE**
2—55 ton Vulcan steam, built 1933, power reverse, air operated fire doors, National Board Boilers, used 11 months —for sale or rent.

**LOCOMOTIVES, NARROW GAUGE**
6—Vulcan and Porter locomotives 15 to 25 tons steam 36" gauge.
6—Plymouth and Whitcomb 5, 7, 12 and 16 tons capacity 24, 30 and 36" gauge gas.
6—4 ton storage battery locomotives 36" gauge.
Vulcan, Porter and Heisler 15 to 40 tons 36" gauge steam.

**SHOVEL**
1—P & H Model 900 full revolving crawler tread diesel powered shovel 3 or 3⅛ yd. dipper 200 H.P. Fairbanks Morse diesel motor. Weight 311,000 lbs. for sale or rent.

**AIR SEPARATORS**
2—Kent Mill Co. 9' size air separators.

**STONE CRUSHING PLANT**
1—850 tons capacity per day, primary crusher, jaw crusher, two secondary crushers, vibrating screens, etc.

**WE WILL BUY ANY MODERN PIECE OF EQUIPMENT ANYWHERE.**

**A. J. O'NEILL**
Lansdowne Theatre Building
Lansdowne, Pa.
Philadelphia Phone Madison 8300

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# BARGAIN PRICES
ON
# RUBBER BELTING
TRANSMISSION—CONVEYOR—ELEVATOR

## "V" BELTS
FOR
PUMPS—CRUSHERS—PULVERIZERS—ETC.

## RUBBER HOSE
FOR
AIR—WATER—STEAM—ETC.

Partial Stock List

## NEW AND HEAVY DUTY
Conveyor and Elevator Belting

| Quantity | Width | Ply | Top Cover | Bottom Cover | Type |
|---|---|---|---|---|---|
| 500 Ft. | 48" | 8 | 1/8" | 1/16" | Conveyor |
| 505 " | 36" | 6 | 1/8" | 1/16" | " |
| 856 " | 30" | 6 | 1/8" | 1/16" | " |
| 520 " | 30" | 5 | 1/8" | 1/16" | " |
| 180 " | 24" | 6 | 1/16" | 1/16" | Elevator |
| 2305 " | 24" | 5 | 1/8" | 1/32" | Conveyor |
| 1298 " | 24" | 4 | 1/8" | 1/32" | " |
| 250 " | 22" | 8 | 1/16" | 1/16" | Elevator |
| 1874 " | 20" | 5 | 1/8" | 1/32" | Conveyor |
| 520 " | 20" | 4 | 1/8" | 1/32" | " |
| 506 " | 18" | 6 | 1/16" | 1/16" | Elevator |
| 1765 " | 18" | 4 | 1/8" | 1/32" | Conveyor |
| 285 " | 16" | 6 | 1/16" | 1/16" | Elevator |
| 1450 " | 16" | 4 | 1/8" | 1/32" | Conveyor |
| 516 " | 14" | 6 | 1/16" | 1/16" | Elevator |
| 509 " | 14" | 4 | 1/16" | 1/32" | Conveyor |
| 420 " | 12" | 6 | 1/16" | 1/16" | Elevator |
| 385 " | 12" | 4 | 1/16" | 1/32" | Conveyor |

**We will cut any of above rolls. Advise desired lengths and widths and we will promptly quote prices. Many other sizes in stock for immediate shipment.**

**CARLYLE RUBBER CO., Inc.**
62 Park Place New York, N. Y.

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Welding Outfits $29.75 to $76.06
Cutting Outfits $49.47
Welding Torches $11.78 up
Cutting Torches $17.93 up

**Superior Oxy-Actylene Co.**
Dept. W
Hamilton Ohio

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## FOR SALE
A Marion Caterpillar Diesel drag line or crane—80' boom—2½ cubic yard bucket—located Barge Canal, State of New York.

**H. P. GUION**
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# Index to Advertisers


Allis-Chalmers Mfg. Co....8, 9
American Blower Corp..... 53
American Cable Div..... .....Inside Back Cover
American Chain & Cable Co., Inc. ..... .....107, Inside Back Cover
American Pulverizer Co....123
American Steel & Wire Co.. 17
Anchor Concrete Machy. Co. ..... 99

Babcock & Wilcox Co..... .....Front Cover
Bacon, Earle C., Inc.....130
Barber-Greene Co. ..... 10
Baughman Mfg. Co.....125
Besser Mfg. Co..... 92
Bethlehem Steel Co..... 12
Blaw-Knox Co. .....125
Bradley Pulverizer Co.....127
Brooks Equipment & Mfg. Co. .....116
Bucyrus-Erie Co..... .....Outside Back Cover
Buell Engineering Co..... 69

Caterpillar Tractor Co..... 3
Chicago Bridge & Iron Co...121
Chicago Perforating Co....129
Chicago Steel Foundry Co.. 72
Classified Advertising..131-135
Cleveland Wire Cloth & Mfg. Co. .....136
Coast Metals, Inc. ..... 71
Columbia Steel Co..... 17
Combustion Engineering Co., Inc. ..... 59

Davenport-Besler Corp. ....126
Deister Concentrator Co....127
Dempster Brothers, Inc.....113
Diamond Iron Works, Inc...127
Dixie Machinery Mfg. Co.... 71
Dorr Company, Inc. ..... 61

Eagle Iron Works.....115
Easton Car & Construction Co. ..... 1
Ensign-Bickford Co.....138

Flexible Steel Lacing Co....125
Frog, Switch & Mfg. Co....127
Fuller Co. ..... 74

Gardner-Denver Co. .....117
General Electric Co.....44, 45
Gruendler Crusher & Pulv. Co. .....126
Gulf Refining Co. ..... 21

Hardinge Co., Inc.....124
Hardsocg Drill Co.....126
Harnischfeger Corp. .....123
Harrington & King Perf. Co. .....128
Hayward Co. .....129
Hazard Wire Rope Div.....107
Heltzel Steel Form & Iron Co. .....105
Hendrick Mfg. Co.....119

Industrial Brownhoist Corp.121

Jackson & Church Co.....102
Jaeger Machine Co..... 95
Jeffrey Mfg. Co.....129
Jones, W. A., Foundry & Mach. Co. .....122

Kent Machine Co.....102
Kern, Fred T., Co.....118
Keystone Driller Co.....116
Kramer Products Co..... 99

Leschen, A., & Sons Rope Co. .....109
Lima Locomotive Works, Inc. (Shovel & Crane Div.) .....115
Link-Belt Co. .....123
Ludlow-Saylor Wire Co..... 18

McLanahan & Stone Corp...129
Manhattan Rubber Mfg.....129
Manitowoc Engineering Wks. ..... 55
Marion Steam Shovel Co.... 16
Master Builders Co..... 97
Merrick Scale Mfg. Co..... 73

National Powder Co..... 66
National Wire Cloth Co., Inc. .....129
Naylor Pipe Co.....137
Nordberg Mfg. Co..... 63
Northern Blower Corp..... 62
Northwest Engineering Co.. 15

Owen Bucket Co.....136

Page Engineering Co..... 6
Parsons Engineering Corp..112
Pennsylvania Crusher Co... 49
Portland Cement Assn..... 98
Productive Equipment Corp.128

Ransome Concrete Machy. Co. .....100
Raymond Pulverizer Div.... 59
Robins Conveying Belt Co.. 22
Roebling's, John A., Sons Co. .....124
Ross Screen & Feeder Co...127
Ryerson, Jos. T., & Son, Inc. .....129

Sauerman Brothers .....119
Schaffer Poidometer Co..... .....Inside Front Cover
Simplicity Engineering Co..117
Sly, W. W., Mfg. Co..... 43
Smidth, F. L., & Co..... 67
Smith Engineering Works.. 11
Stearns Mfg. Co.....100
Strong-Scott Mfg. Co..... 36
Straub Mfg. Co.....121
Stulz-Sickles Co.....129
Sturtevant Mill Co..... 51

Thew Shovel Co..... 5
Thornton-Tandem Co..... 56
Timken Roller Bearing Co.. 4
Traylor Engineering & Mfg. Co. ..... 7
Tyler, W. S., Co.....130

U. S. Steel Corp..... 17
Universal Crusher Co..... 13
Universal Vibrating Screen Co. .....121

Wall-Colmonoy Corp.....123
Western Precipitation Corp. 57
Wilfley, A. R., & Sons, Inc. 65
Williams Patent Crusher & Pulv. Co. ..... 73

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# Chin Cupping

*Chin Cupping (so we hear) is on the increase. Chin cupping is perhaps one of the greatest mechanical aids to concentration such as thinking in a complete circle. During the depression it denoted losses and deep thought on how to get a share of no business. Today it is indulged in as a process for solving the problem of how to get the most production in the shortest time at the least cost so there'll still be time during this good business to worry how to get more business that needs the most production in the shortest time, etc. For construction men, instead of chin cupping, we recommend this:*

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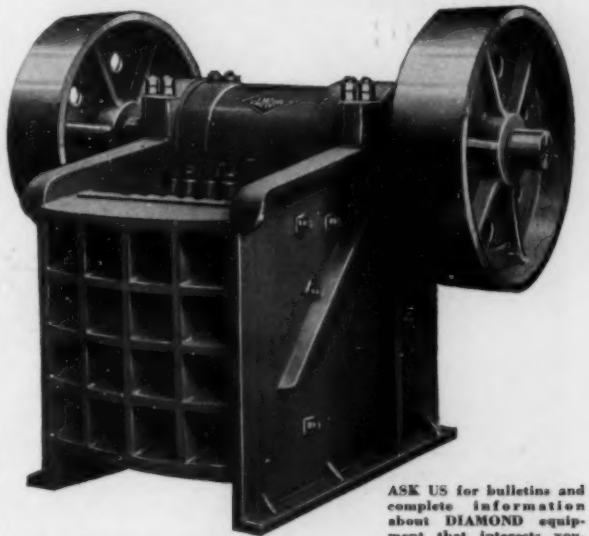

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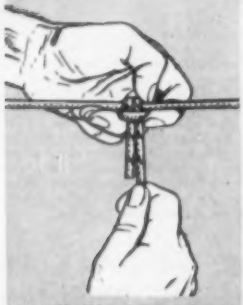
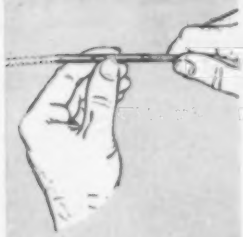


2. Half hitch branch to main line.

3. Connect main line lengths with square knot.



4. Fuse and cap on end of main line.

**IMPORTANT**

Branch lines should lead away from main lines at *right angles*. Avoid kinks and small loops.

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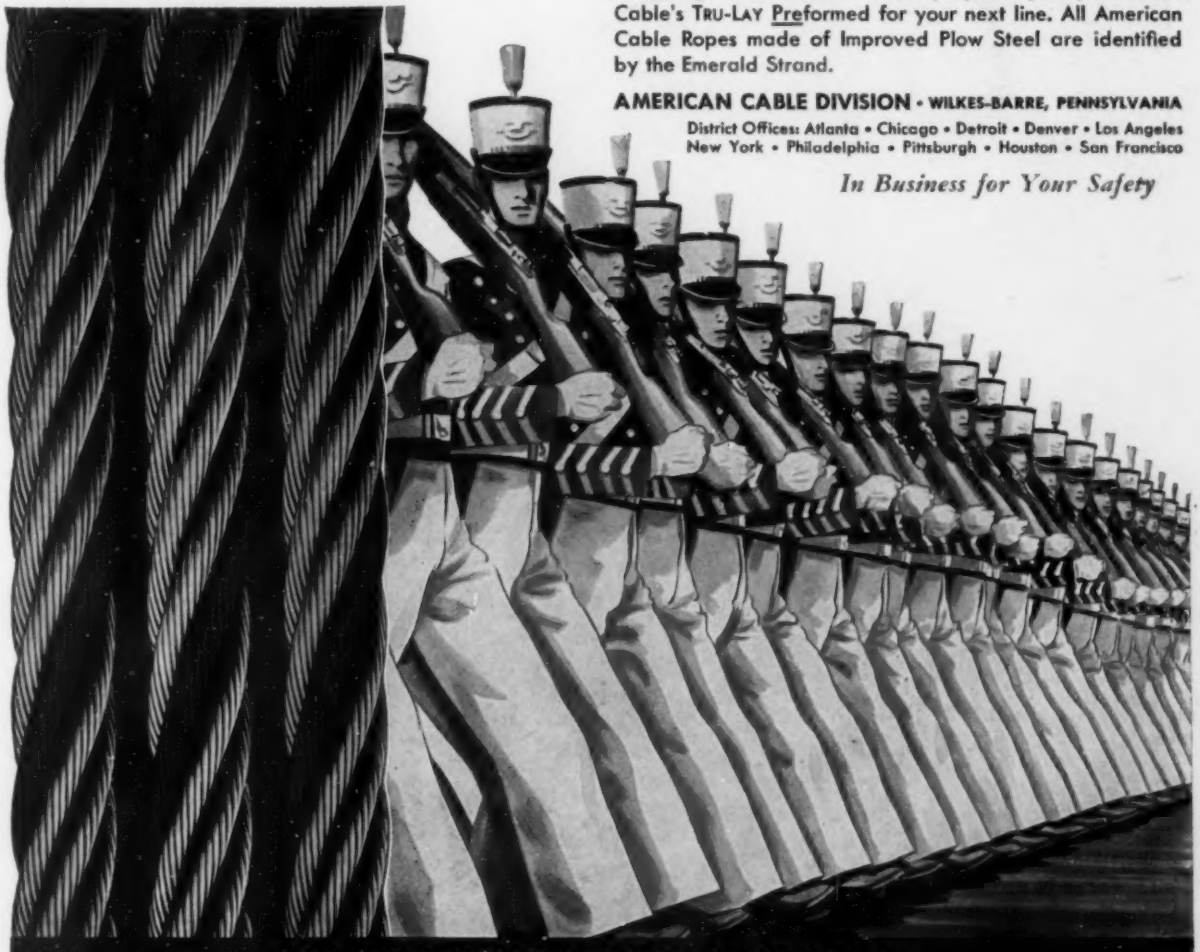

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